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**ESSAY ON BURNS,**

**BY**

**EDWARD KENTISH, M. D.**

**1817.**

**Price 10s. in boards.**

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AN  
**ESSAY ON BURNS,**

IN  
*TWO PARTS;*

PRINCIPALLY  
 ON THOSE WHICH HAPPEN TO WORKMEN IN MINES,  
 FROM THE EXPLOSIONS OF CARBURETTED  
 HYDROGEN GAS:

CONTAINING ALSO A VIEW OF THE  
 OPINIONS OF ANCIENT, AND MODERN AUTHORS  
 UPON THE TREATMENT OF ACCIDENTS  
 BY FIRE:

AND INCLUDING  
 A VARIETY OF CASES CONDUCTED UPON  
 DIFFERENT PRINCIPLES.

THE WHOLE  
*TENDING TO RESCUE THE HEALING ART FROM EMPIRICISM,  
 AND TO REDUCE IT TO ESTABLISHED LAWS.*

The First Part originally published in 1797, the Second Part in 1800.

BY

**EDWARD KENTISH, M.D.**

Physician to the Bristol Dispensary and St. Peter's Hospital.



PRINTED FOR LONGMAN, HURST, REES, ORME AND BROWN;  
 AND BARR, AND SON, BRISTOL.

1817.





The assignment of a multiplicity of causes, to account for particular phenomena, always betokens a backward state of knowledge. The business of science is to generalise facts, to class phenomena under distinct heads, and shew their dependence upon a common principle or cause. In the progress of human reason, polytheism has yielded to the existence of one God; the intricate and seemingly opposite phenomena of matter and motion have been referred to one general law of gravitation; the puzzling and diversified appearances of electricity have been reduced to a few plain rules; the multitude of facts concerning light and colours have been in like manner arranged into a scientific form; and both the RAINBOW and the TELESCOPE bear witness to the simplicity of optics.

S. L. MITCHELL, M. D.



TO THE  
MEDICAL SOCIETY OF NEWCASTLE  
UPON TYNE.

*THE second edition of this Essay cannot with propriety be dedicated to any other than yourselves. While associated with you, I first investigated my subject, weighed my principles, and regulated my practice thereby. Your approval of that practice the experience of twenty years has confirmed, and the accessary suffrage of practitioners in the coal-district of Staffordshire has established its validity. Your body, consisting of Members of both Colleges, Physicians and Surgeons, must be considered as a committee, to determine what is sound practice in the object proposed. That I have the sanction of the Physicians' College in particular, is inferred from their Formula for a Linimentum Terebinthinæ, which, Dr. Richard Powell states, was*



*inserted expressly for my purpose. We are informed by Dr. Hamel, of St. Petersburg, that my practice is recommended generally in the Surgical School of Russia; and from the Medical Journals of America we learn, it is adopted over the whole of that continent. I may therefore conclude, safely I trust, that my end is attained, namely, that of rescuing from empiricism one particular branch of the healing art, and reducing it to established laws: this has been principally effected by your energetic assistance. May harmony, such as always distinguished your Society, while I numbered in it, be still its characteristic; and, that prosperity may be the result is the fervent wish of*

*YOUR OBLIGED AND SINCERE FRIEND,*

**E. KENTISH.**

Park-Street, Bristol.

Feb. 2, 1817.



## Original Dedication.

### TO THE PROPRIETORS OF COLLIERIES UPON THE RIVER TYNE.

GENTLEMEN,

*IN* sending the following *Essay* into the world, I take the liberty of addressing it to you. There are two motives that induce me to do this: First, That I may profit by this opportunity of thanking some of you for the favours which I have received, and which have enabled me to collect the following facts. Secondly, Because you are the natural guardians of the health and comforts of an important class of workmen, for whose benefit it is particularly written. Enquiries into the diseases which are peculiar to any class of workmen have ever been deemed objects of the first importance, insomuch that many philosophical societies have offered premiums for such productions; but, so far from any thing of this kind having taken place upon this subject, I am afraid the following remark will be found as true as it is extraordinary: That during a period exceeding six hundred years that the coal-trade has flourished in this neighbourhood, not a single remark upon the subject has been preserved upon record, though during that period some of the first medical and surgical men in the kingdom have had the phenomena constantly before their eyes. What causes can be assigned for such inattention to the interests of humanity? Ignorance and prejudice on the part of



*the people, and disgust on that of the faculty. These appear to me the principal causes why so little attention has been paid on the part of the practitioners. I need not point out to you, Gentlemen, that an ignorant old woman, or a more ignorant man, has frequently been enforced upon you, by the turbulent call of your people, against your better judgment. Can it be wondered at, when the best efforts of a man of sensibility are thus repelled, that disgust is too frequently the consequence? I must confess, I have felt it myself in the moment; but, when I have thought of the greatness of the object, viz. that of acquiring the power of preserving the lives of otherwise devoted individuals, on whose exertions perhaps families depended for their very existence, the bare idea has ever increased my efforts, and made me return to the charge with redoubled energy. Should the dispelling of this cloud of ignorance and prejudice from the minds of the people appear to you in the same light as it does to me, I should have little doubt of pointing out to your consideration means that would tend to fix the treatment on such sure principles, as would procure the greatest safety to your workmen, give the result of facts interesting to society at large, and be truly honourable and worthy such patronage.*

*I have the honour to be,*

*Gentlemen,*

*Your obliged obedient servant,*

**E. KENTISH.**

Newcastle-upon-Tyne, Feb. 2, 1797.



## CONTENTS.

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### PREFACE.

Reasons for not sooner republishing this Essay. Motives for republishing it. Prejudices against the Treatment recommended; page xxi.—Theory and Practice reciprocally aided the Treatment. Different Opinions still continue. Mr. Samuel Cooper's Opinion, xxii.—Author Censured for speaking with confidence in the result of Cases differently treated. Certainty of Prognosis shews the advancement of Medical Science, xxiii.—Controul we possess, on the various Actions of the System, pointed out, xxiv.—Professor Dzondi's Mode of Curing Burns by Cold, xxv. vi.—Treatment placed in the Converse, or the manner in which he would treat Frost-Bite, *ibid.*—Remarks on the Practice, xxvii.—Riche-rand's Surgical Nosography, *ibid.*—On Gangrene by Burns, xxviii. ix.—Remarks, *ibid.*—A Case, xxx.—Case of Sir Richard Phillips's Daughter, from the Monthly Magazine of August 1816, xxxi. ii.—Remarks on this Case, *ibid.*—Letter from Mr. Leighton, Secretary to the Medical Society of Newcastle-upon-Tyne. Minute of Proceedings of the Medical Society of Newcastle-upon-Tyne, xxxiii.—Case by the late Mr. Frederick Horn, contrasting a different Treatment, xxxiv.—Letter from Mr. Badley, Surgeon, of Dudley, shewing the Effects of different Treatment in Burns, xxxv. vi. vii.



## Part the First.

### INTRODUCTORY CHAPTER.

*Analysis of Airs.—Lavoisier's Experiments.—Phenomena of Combustion in general.—Water, its decomposition.—Experiments.—Production of Hydrogen Gas in Mines.—Of Combustion in Mines in particular.—The effects of these phenomena not previously noticed as happening to Miners.*

To explain the Effects of Fire upon the Human System, object of the Essay; page 1.—Atmospheric Air consists of two Elastic Fluids. Analytic method of discovering their Principles, by the Oxydation and Disoxydation of Mercury, 2.—Effects of these Principles, when separate, upon Life, 3.—One of them, favourable to Life and Combustion, is denominated *Oxygen Gas*; the other, adverse to both, *Azotic Gas*, 4.—Oxygen and Azotic Gas are also Compound Fluids; Combustion takes place on the principle of Affinity, 5.—Decomposition of Water: Hydrogen Gas, one of its constituent Principles, obtained by passing Water over Ignited Iron; Oxydation taking place at the same time in the Iron proved the existence of Oxygen, 6.—Water *synthetically* formed, by the Combustion of Hydrogen with Oxygen Gas, *ibid.*—Water, by being in contact with Pyrites, Metals, or Coal, may be Decomposed, and Hydrogen Gas Separated, *ibid.*—Phenomena of Combustion of Hydrogen Gas, in Mines, resembles in many respects the Explosion of Gunpowder in Pieces of Ordnance, 7.—These Phenomena, as hurtful to Miners, not noticed by any Medical Author, 8.

### CHAPTER II.

*Practice and Opinions of the older Authors.—Heister.—Van Swieten's Commentaries.—Practice and Opinions of the Moderns.—Benjamin Bell.—Encyclopedie Methodique.—Medicine Eclairée.—Practice and Opinions of various Practitioners.*

Medical Authors should be acquainted with previous Opinions, p. 8.—Heister's division of Burns into four Classes, 9.



—Astringents or Stimulants recommended, 10.—Emollients recommended, 11.—Even Blood-letting and Purgatives enjoined, 12.—Remarks on Heister's Practice, 12, 13.—Van Swieten's Commentaries on Boerhaave's Aphorisms, *ibid.*—Emollients for the Cure of Burns, 14, 15.—Relation of Boerhaave's Accident from the bursting of Papin's Digester. Treatment, 20.—Contrasted with Mr. Hopper's Case, *ibid.*—Little Information got from old Authors on this subject, 21.—But two Rules on which all agree; one unnecessary, the other fallacious, 22.—Benjamin Bell's Opinions and Treatment of Burns, 23 to 25.—Translation of article *Brulure*, from Encyclopedie Methodique, 26 to 32.—Coincidence of Sentiments between its Author and Mr. Bell, *ibid.*—Medicine Eclairée. Memoir communicated to Monsieur Fourcroy, on Burns, *ibid.* to 38.—Case by Monsieur Emasle, *ibid.* to 41.—Remarks thereon, *ibid.* to 42.—Case by Monsieur Didier, 42 to 45, with Remarks, *ibid.* 46.—Case by Monsieur Reyne, 47 to 51, with Remarks, *ibid.*—Conversations respecting Burns, with Mr. Horn. Treatment in the Navy during the American War, 52.—Treatment in the Whitehaven Collieries, 53.—Author's Reasons for publishing, *ibid.* 54.

### CHAPTER III.

*First Mode of Treatment.—Progress of Medicine much retarded by the Narration of Cures in unimportant Cases.—A relation of Cases which would terminate in Life or Death, according to various or different treatments, is the best mode of ascertaining truth. External Emollient Applications universal in the neighbourhood of Newcastle-upon-Tyne.—Case of John Thompson, which terminated fatally on the ninth day.*

Relation of Cures in unanalysed Cases has retarded the progress of Medical Science, and wonderfully favoured the influence of Empiricism, even among the Intelligent, 54 to 56.—Cases which would probably terminate in Death or Cure, by different modes of Treatment, the best to be brought forward, for ascertaining the relative Merit of different Modes, 57.—General Method of Treatment at the Collieries of the Northern District, when this Inquiry commenced, *ibid.* to 60.—Case, of John Thompson, 61.—Shivering-Fit immediately followed his Immersion in the Flame, 62.—Journal of the Case, 62 to 65.

## CHAPTER IV.

*Second Mode of Treatment.*—*The present ardour in search of Truth promises much, but is liable to abuse.*—*Observations on the Case of John Thompson.*—*The Case of John Clark: Internal treatment stimulant; life preserved to the twelfth day.*—*The Case of Thomas Johnson: Internal treatment stimulant, External emollient; Life preserved, but the Cure tedious, from a too long continuance of the Internal stimulant treatment.*

Reason for not reciting more Cases, 66.—Remarks on John Thompson's Case, 67.—Consequence of implicit Obedience to the Mandates of Medical Authorities, *ibid.*—Freedom from this Yoke ultimately advantageous, 68, 69.—The frequent Shivering not observed by former Authors, *ibid.*—The primary Fever from a Burn caused by Irritation, not Inflammation, 70.—Scarifications, to prevent deep-seated Suppuration, reprobated, *ibid.*—Fatal Termination of Burns, A Mortification of the Irritated Parts and Death from Febrile Exhaustion, 71.—John Clark's Case; severe Shivering-Fit; Opium freely administered, 72.—Journal of the Case, to 78.—External Means the same as John Thompson's; Internal Treatment stimulant; life preserved to the twelfth Day, *ibid.*—Thomas Johnson's Case; Stimulant Plan internally, Oily Treatment external; Suppuration on the eighth Day, 79 to 82.—Cure tedious, above Twelve Months in completion; probable Cause, 82 to 86.

## CHAPTER V.

*Third Mode of Treatment.*—*Observations on the preceding Cases.*—*Change of Treatment indicated, which was at length established on the following principles.*—*Effects of Heat, and Cold.*—*Of Injuries produced by Fire; necessary Remedies, and their Mode of Action.*—*Division of Burns into two Classes: 1st, where the action of the part is only increased; 2dly, where the action of some parts is increased, and some parts destroyed.*—*Treatment of the First Class.*—*Treatment of the Second Class.*—*Cases of James Jackson, Mr. Glynn, Thomas Smith, Mr. Hopper.*

Fatal termination of Cases under the first Mode of Treatment suggested, that Mortification attended in all instances from the Excess of Stimulus (Caloric) being instantly followed by the



greatest Diminution of it, (Cold)—that the consequent Symptomatic Fever thus excited exhausted the System without Suppuration, and ended in Death, 87 to 89.—On the Effects of Heat, 90.—The terms *Heat* and *Cold* indefinite, 91.—Effects of Heat below the Freezing-Point, 92, 93.—John Hunter's Experiments, 94, 95.—Indications of Cure in the Disease termed "Frost-bitten."—Law of the System deduced from Reasoning and confirmed by long Practice by Natives of Cold Climates. On the Treatment of such Accidents, 96, 97.—Of the Effects of Heat above the Freezing-Point, or of what is termed Burning, 98, 99.—Division of Injuries from Excess of Caloric into two Classes, 102.—What ought to be our Aim in treating Accidents from Fire; Application of the Principles mentioned relating to the Management of Accidents from Extreme Cold, 103 to 106.—In the Cure of Burns, the highest Stimulus being indicated, *Fire* itself may, and has been, applied with advantage, *ibid.*—Order of Treatment enforced in this Essay the Reverse of that usually pursued: instead of Bland, Oily, and Debilitating Means at the beginning, the strongest Stimuli; instead of Stimuli at the Suppurative Stage, Cooling, Bland Remedies, 107, 108.—Oily Applications, *ibid.*—Opium dissolved in Oil, 109.—Carron Oil, *ibid.*—Goulard's Cerate, 110.—Fluor Volatile Alkali, *ibid.*—Le Sage's and Fourcroy's Opinions upon its Action, 111.—Vitriolic Æther, *ibid.*—Experiment, 112.—Improper Application from the great Cold produced by Evaporation; Thermometer falls from 62 Degrees above to 24 below the Freezing-Point, *ibid.*—Alcohol, 113.—Experiment, *ibid.*—Essential Oil of Turpentine. Experiment, 114.—Superiority of this Application to Parts irritated from Fire, 115.—External Treatment, 116 to 121.—Internal Treatment, *ibid.* to 123.—Subdivision of Burns, *ibid.*—1st, External Treatment, 124 to 127.—2dly, Internal Treatment, *ibid.* 128.—James Jackson's Case, 129 to 133.—Mr. Glynn's, 134 to 138.—Thomas Smith's, 139 to 141.—Mr. Hopper's, similar in many respects to that of Boerhaave (related in page 21), 142 to 145.

## CHAPTER VI.

*Extracts and Remarks upon the Communication of Mr. David Cleghorn (an unprofessional man) to Mr. John Hunter, on the Treatment of Burns and Scalds.—Letter from Thomas Leighton, Esq. Surgeon to the Newcastle-upon-Tyne Infirmary.*

In the former Edition of this Essay, Contents of this Chapter appeared as an Appendix, 146.—Application of Vinegar recommended, 147.—When Suppuration takes place, Chalk as an Absorbent, *ibid.*—General Remedies employed by Mr. Cleghorn, *ibid.* to 147.—Remarks on Mr. C.'s Practice, 150.—Mr. Thomas Leighton's Letter, 151 to 153.

---

## Part the Second.

## CHAPTER I.

*Preliminary Observations. Mr. Bell's Examination.—Aitkin's System of Surgery.—Dr. Underwood's Treatise on the Diseases of Children.—Perkins's Metallic Tractors, as a Cure for Burns.—Importance of the investigation.*

Principles recommended Experience approves, 155.—Mr. Bell's Examination by Dr. Blane, and Dr. Johnston, *ibid.*—Questions proposed to Mr. Bell, 156.—Proof that the former part of the Essay (printed separately, in 1797,) was not generally known, *ibid.* Candour of Dr. Blane, and Dr. Johnston, 157.—Extracts from Dr. Aitkin's Elements of Surgery, *ibid.*—Inefficacy of his Mode, 158.—Extracts from Dr. Underwood's Treatise on the Diseases of Children, *ibid.*—This Work being much read by Mothers, important to refute its Errors, 159.—Perkins's Metallic Tractors as a Cure for Burns; Dr. Warwick, of Rotherham, Yorkshire, shews their total Want of Power, *ibid.* 160.—Importance of the Subject under Investigation, the Lives of many depending on the Treatment, *ibid.* 161.



## CHAPTER II.

*Observations on Sir James Earle's Pamphlet: "On Lessening the Effects of Fire upon the Human Body, etc."* He laments the general want of principle for the treatment of such cases.—*As Heat had produced the injury by entering into, and remaining in the body, it was supposed Cold would be the best application to draw it out of the body; with this intention, Ice and Cold Water were used.*—Cases related, and referred to by Sir James Earle.—Case of a Young Lady under the care of Sir Walter Farquhar, narrated by herself.—Remarks on this Case. Patients, not having experience, cannot form a correct judgment of their treatment.—Effects of Heat and Cold upon the System, from which the principles of the new practice are deduced.—Case related by the late Mr. John Anderson, Surgeon, of Newcastle-upon-Tyne.—Relative effects of different practice on the same patient.—Remarks upon that Case.

Author's Opinions probably unknown to Sir James Earle; Importance of the Subject an Apology for free Discussion: Early state of Medical Knowledge; traditionary only; its Preservation by Printing, 163.—Utility of periodical Publications. Fortunate situation of the Author, for collecting Facts, 164.—Sir James Earle laments a want of Principle in the Treatment of Burns;—notices some contradictory Remedies recommended, *ibid.*—Sir James's Opinion that the matter of Heat continues to exist in the Burnt Parts; Chaptal of this opinion; ascertaining the Fact difficult and unimportant: Effects of *Caloric*, when applied to the Body, ascertainable, 165.—Sir James's Principles and Treatment, *ibid.*—Case, of a Medical Gentleman, burnt by inflamed Spirit of Wine, *ibid.*—This Case compared with Boerhaave's, to shew the Superiority of Cold Applications; Remarks, 166.—Cases of *extreme* Severity best illustrate the Advantages of any particular Treatment, 167.—Case of a Lady; Consultation with Sir Walter Farquhar; Circumstances detailed from Recollection; consequent Defect, 168.—Case of Sir James Earle's Child, 169.—Inferences by Sir James, 170.—Author's Remarks, 171, 172.—Case, by Sir James, of a poor Woman, 173.—Supposed Aggravation of her Symptoms from previous Terebinthinate Applications, 174.—Sir James prejudiced in

his Conclusions, *ibid.*—Dr. Warwick's Experiments. Case of a young Lady under the care of Sir Walter Farquhar, narrated by herself, 175 to 178.—No useful inference, *ibid.* Perkins's Tractors, 179.—Dr. Haygarth on the powers of Imagination, *ibid.*—Magnetism and Tractorism act on the Mind.—Other Causes of Delusion in supposed Cures, 180.—Sir James Earle, and Sir Walter Farquhar, suppose Fire enters and may be drawn from the Body by Cold, 181.—Man capable of sustaining great vicissitudes of Temperature, *ibid.*—Effect of diminished Temperature. Caloric forms a Chemical union: Combined with Animal Fibre, destroys Organization, 182.—Case of Injury from injudicious Application of Heat to a Shipwrecked Mariner, which ought not to have taken place, had the principle laid down by Sir James Earle and Sir Walter Farquhar been just, 183, 184.—Case in Support of the Utility of the Practice recommended in this Essay, by the late Mr. John Anderson, Surgeon, of Newcastle-upon-Tyne, 185.—Mr. Anderson's Letter, 186.—The Case, *ibid.*—Remarks on it, 188.

### CHAPTER III.

*Remarks on the Treatment of Burns, shewing the Difficulty of overcoming the Prejudices of Early Habits, and establishing Principles for conducting the Treatment of any disease.—First Species of Burn.—Second Species of Burn.—The use of Carbonate of Lime, as an Absorbent, in this and a variety of other diseases.—Case of George Clark.—Observations arising from the above case.—Case of Thomas Pyle.—Case of John Dunwiddie, occasioned from an explosion of Gunpowder.—The practice recommended to Surgeons of the Navy, by Dr. Trotter.—Its use also to Army-Surgeons.—Letter from Mr. S. Hammick, Surgeon, Royal Naval Hospital, Plymouth.—Letter from Mr. Horn, Surgeon to the Newcastle Infirmary.—Remarks upon that Letter.—A second Letter from Mr. Horn, with Observations.—Letter from Mr. Fife, Surgeon, Newcastle.—Case by Mr. Bell, Surgeon of H. M. S. Pelican.—Observations of Mr. Bell and Mr. Westgarth, on the Anodyne effects of the Essence of Turpentine, when applied to the Burns of young Children, even when the cuticle has been lacerated.*

Want of Precision in applying Ice and Cold Water, by Sir James Earle, 191.—Opinions of others support the new



Practice, *ibid.*—Principles interesting, with reference to other diseased Actions, 191.—Difficulty in overcoming Prejudices. Mr. Taylor, Apothecary to the Newcastle Infirmary, a Convert to the New Practice, which he had withstood *forty years*, *ibid.*—Superiority of the New Treatment pointed out to the Pupils of a Public Institution, 192.—Mr. John Hutchinson, one of the Pupils, introduces it at the Manchester Infirmary, where it is general, 193.—Burns, in the former Part, divided into two Species; the Division still adhered to, *ibid.*—First Species, has the Action of a Part Increased only, 194.—Second Species, has some Parts destroyed, while others have only Increased Action, *ibid.*—A due Equilibrium of the Exhalents and Absorbents should be maintained, 195.—Absorbents not to be too long excited; or a Secondary Irritation takes place, which is best soothed by Linseed Cataplasms, *ibid.*—Treatment of Destroyed Parts to be judged of by Effects upon the Living, 196.—Sympathy of the Stomach available to general excitement of the System, *ibid.*—Excitement, continued too long, increases Discharge, and frequently produces Hectic, as in the Case of Thomas Johnson, 197.—Effects of Counter-Irritation, *ibid.*—Difficulty in repressing growth of Fungus, and finding a good Absorbent for Increased Secretion on Injured Surfaces, 198.—Scraped Chalk recommended by Mr. Cleg-horn, of Edinburgh, *ibid.*—Peruvian Bark and Rhubarb recommended by Sir Everard Home, *ibid.*—Carbonate of Lime probably of more use than as a mere Absorbent; its abundance in Nature, and presence in the Animal Economy, 199.—Process of Skinning facilitated by its Use, 200.—Case of George Clark, 201.—Accident from explosion of Carburetted Hydrogen Gas, 202.—Attacked with severe Shivering-Fits, *ibid.*—Treated with Æther and Opium *internally*, and Essence of Turpentine *externally*, *ibid.*—Cataplasms to the Limbs on the second Day, 203.—Functions of the Brain disturbed by Sympathetic Irritation; Excitement of the Stomach beneficial; Secretion of Pus on the third Day, 204.—Symptoms more favourable on the fourth Day, 205.—This Case claims attention, 206.—Powdered Chalk to the Secreting Surfaces, 207.—Ninth Day frequently observed critical. Spontaneous Diarrhœa occurs; Benefits occasioned by it, 208.—Counter-Irritation useful in various Complaints; elucidated by a recent Case, 209.—Quantity of Skin formed on the eleventh Day, 210.—Practical Facts deduced from an Accidental Occurrence, 211.—Eighteen Years have not diminished the Impression of the utility of this Case, 212.—Extensive diffusion of the Principles of the New Practice, *ibid.*—Case of Thomas Pyle, aged 15, Treated on the same Principles, 213.

—Purging in the Secreting Stage of the Complaint; its Benefits; great Utility of Purging in Fevers, as recommended by Rush, Hamilton, and others, probably arises from Counter-Irritation, 214.—Case of John Dunwiddie, aged 10, from Explosion of Gunpowder, 215.—To appreciate the New Method of Treating Burns, within the province of Naval and Military Surgeons.—Dr. Trotter's attention to the Subject, 216.—Letter from Mr. Stephen Hammick, Surgeon, Plymouth: Practice in Burns at the Royal Naval Hospital; External Application of Vegeto-Mineral Water discarded, and Spirit of Wine with Camphor; Trial made of Oleum Terebinthinæ, 217, 218.—Remarks, 219.—Letter from Mr. Frederick Horn, Surgeon to the Newcastle-upon-Tyne Infirmary, 220.—Case, related by him, of a Sailor burnt by Coal-Tar: Oleum Terebinthinæ mitigated the Pain. Case, by Mr. Horn, of a Girl seven Years old, whose Clothes took Fire; Stimulant Plan, *externally* and *internally*, pursued with advantage, 221, 222.—Remarks on Mr. Horn's Letter, 223.—His Second Letter, 224.—Case of George Smith, Under-viewer of Ravensworth Colliery, Burnt by Explosion of Carburetted Hydrogen; Treatment; Suppuration on the third Day, 225, 226.—Benefit of Chalk, 227.—Extensive formation of Skin on the twelfth Day, 228.—Observations resulting from Mr. Horn's Letter, 230, 231.—Letter from Mr. Fife, Surgeon, of Newcastle-upon-Tyne, 232.—Case of a Brewer, Scalded by Boiling Wort, *ibid.*—Shivering-Fit; Stimulant Plan; Cure complete in three Weeks. This Case contrasted by Mr. Fife, with a similar one treated by Refrigerents, 233, 234.—Remarks, 235.—Case related by Mr. Bell, Surgeon to the Pelican Sloop of War, *ibid.*—Essence of Turpentine supposed to give Pain, but from the observation of Mr. Bell and Mr. Westgarth, it has a Soothing quality. Author's Explanation of this Phenomenon. Conclusion, 236, 237.



## Errata.

Page 58, line 14. For 'oils', read *oil*.

Page 83, line 10. For 'abomen,' read *abdomen*.





## PREFACE.

**B**OTH the first and second part of this Essay have for several years been out of print. I have resisted many applications to commit the work to the press a second time: I did so, because the extensive extracts made from it, in some of the new and popular Systems of Surgery, rendered it, in my opinion, at that period, unnecessary; also, because of the frequent reference made to it, in many papers throughout the whole series of the London Medical Journal. These reasons hitherto kept me silent; but, as I now find that a very different practice to that which I have inculcated is frequently followed by practitioners, and said to be *my practice*, I think it a duty to give to the profession an account of what that practice really was. Many Surgeons, who have applied the Linimentum Terebinthinæ of the London Pharmacopœia, have supposed that they have treated burns according to my principles, though they have continued its application until serious mischief has been induced. I have conversed with surgeons, who have told me, that they approved my theory; but that they were afraid to venture upon the practice, as they were young practitioners, and the prejudices of the people were strong against INNOVATION. These were persons who had not read my Essay; I am therefore

induced to reprint it, that it may be perused; and such as do so will find I have fought the hydra Prejudice for them. They will see that others have ventured to follow the practice, who bear testimony to the truth of my observations; they will also see the state of the practice at the period when I first had my attention called to it, which was in the year 1784. There was no aid to be derived from the perusal of Medical Authors upon the subject: their contradictory opinions left the mind in a greater state of doubt than it could have been in, previous to their being consulted. I had many difficulties and prejudices to contend with, before I was fully assured of the superiority of the treatment I have recommended. When I had accumulated facts, I wished to account for the result: thus the practice led to the theory, and the theory subsequently unfolded to me principles which again further improved the practice. The discussion, which the divulging of these principles has given rise to, has thrown more light upon the treatment of burns in the last twenty years, than had been done before for several preceding centuries.

Still, however, with all this experience, different opinions prevail: some like the theory and fear the practice; others acknowledge the success of the practice but deride the theory: among the latter is Mr. Samuel Cooper, author of a Dictionary of Practical Surgery: after filling five of his columns with extracts from my Essay, he says, speaking of me, "his theories are certainly visionary; they may amuse the fancy but can never improve the judgment. He is a man, however, who has had superior opportunities of observing this part of practice, and the great success of his plan of treatment has acquired very extensive approbation." Visionary as these theories



appear, they improved the practice to what it now is; and I should feel happy to have some similar visions, to assist me in many difficult diseases, where regular modes are now deficient. I have been much censured for the certainty I express in the result of different methods of treatment; but, if I find that by adopting any one in particular I decidedly lose my patients, and that by employing another I as decidedly preserve them, am I to be found fault with for the assertion? Nothing more clearly proves the advancement of medical science, than the certainty of prognosis. Should I not be warranted in saying, by one mode of treatment I should lose my patients in the small-pox, and by another I should save them? Keep patients under the small-pox in close hot rooms, give them plenty of hot spirit and water to throw out the eruption, and there could be but little doubt that a confluent sort would ensue, and destroy the unfortunate subjects. On the contrary, inoculate them, keep them cool both in respect to temperature and diet, there could be but little doubt that they would go through the disease with perfect safety. It is by thus measuring our power of controlling morbid actions of the system, that we are enabled to judge of the progress we make in curing diseases. Even with the bad practice in small-pox, some few individuals might struggle through the malady and escape with life; but nothing short of the grossest ignorance could persevere in so acting. Were such practice to be admitted, the labours of a Sydenham would be vain. There is no doubt but many persons have got well of slight burns and scalds, when nothing but the *metallic tractors* have been used. From Doctor Warwick's experiment, (p. 159) it appears they would have got well equally soon without any application

whatever; yet no one would be so foolish as to say we ought not to use means. For if we can controul the actions of the system in small-pox, which no one doubts, it is surely as evident that we may controul them in injuries arising either from excess or defect of caloric. Some escapes also may have taken place with persons who have been frost-bitten, by suddenly applying heat to them; yet no well-informed practitioner would be induced, on account of such escapes, to apply heat in such a case. When cold is applied to the body, it lessens action; and, if continued and severe, it stops all circulation in the extremities and those parts which are merely supplied by capillary vessels, such as the nose, ears, &c. When parts of the body, by the disease termed frost-bitten, have ceased to act in unison with the body to which they belong, great nicety is required to restore action to those torpid parts. If the general circulation of the body is increased before the circulation of the torpid parts is restored, a solution of continuity would be the consequence, which frequently takes place in cold countries, as may be observed in the loss of ears, part of the nose, toes, and fingers. Experience has taught the natives of cold countries the danger of a too sudden application of heat, after a great abstraction of it. Rubbing frost-bitten parts with snow, washing them with cold water, and avoiding external heat, such as approaching a fire or immersing parts in warm water, are facts with which they have been acquainted for centuries, previously to the reason being explained by the rules of our philosophy. If a medical man had observed some frost-bitten cases escape with life, or, as he might term it, *cured* by the application of heat from a warm-bath, or by hot internal stimulants, he probably might



be induced to write a treatise recommending such practice. The more ably his book would be written, the more likely would he be to perpetuate error and to do mischief; yet in slight cases there is no doubt but there would be many escapes, and he might have a variety of partisans to support his opinions and practice. The converse of this has been done by many medical authors, i. e. the application of cold has been recommended, to obviate the ill effects of heat. Sir James Earle's pamphlet has been already noticed, in the second part of this Essay. I have just seen an account of another author writing a book expressly for the purpose of recommending the use of cold water as the *only* safe remedy for the cure of burns and scalds. In the Medical and Physical Journal for September 1816, is the following notice: "On Burns, and the only safe Remedy for curing them speedily, and without pain, in every stage: By C. H. Dzondi, M. D. Prof. Publ. Ord. of Medicine and Surgery, Director of the Institute for Surgery and Diseases of the Eyes, Halle. 1816."

The Editors of the Journal say, "This little work is deserving of the greatest attention. Dr. Dzondi, in this small treatise, proves cold water to be the first, greatest, and most powerful, nay, the *only* remedy, for preventing the most dreadful consequences in cases of burns, if timely applied and with perseverance. His conviction of its efficacy is partly founded on a multiplicity of experiments made on animals and on himself, and partly results from his most successful treatment of many important cases; he also attempts to prove it *á priori*."

I shall avoid as much as possible entering into a detail upon this subject, and confine myself purposely to combat the principle; otherwise, the analogy attempted to

be drawn, I know not whether by the Journalists or the Professor, between a bruise and a burn, appears to me ill calculated to elucidate the subject. The irritation produced upon the nervous papillæ of the skin by a burn, and the contusion or rupture of a number of vessels by the infliction of a blow, are surely very different, in all their various stages.

I shall therefore proceed, and lay down the Professor's principle as I find it in the Journal.

*“ Appropriate method of healing Burns.*

“ The *only* and proper remedy, to the application of which both nature and instinct lead us, is the opposite extreme, viz. *cold*, which, applied betimes and with perseverance in a sufficiently high degree and fit vehicle, has such a general vigorous effect as speedily to obviate every local and general consequence and effect of *heat*, complete disorganization only excepted; so that in the course of a few hours it establishes a perfect cure.”

This is Professor Dzondi's mode of curing burns. Let us look at it in the converse, when it would stand thus.

*Appropriate method of curing Frost-Bite.*

The *only* and proper remedy, to the application of which both nature and instinct lead us, is the opposite extreme, viz. *heat*, which, applied betimes, and with perseverance in a sufficiently high degree by means of a fit vehicle, has such a general vigorous effect as speedily to obviate every local and indeed other consequence produced by extreme *cold*, complete disorganization only excepted; so that in the course of a few hours it establishes a perfect cure.



Such would be the Professor's practice in frost-bite. What would be the consequence? His patients, in severe cases, would lose their lives or limbs, as the experience of all cold countries informs us. It is fortunate for the human race that the dogmas of professors have no papal infallibility attached to them; otherwise we might expect to see a medical inquisition established, to punish by fire those who had dared to save themselves from being frozen to death, by the heterodox practice which *experience* and *truth* had pointed out, as *the universal law of Nature*. Surely it were better that all the people in Canada should die, than that Professor Dzondi's principles should be *doubted*! Such doctrine was preached by Dr. Sangrado to his pupil Gil Blas, with respect to bleeding and hot water, in the treatment of his patients at Valladolid. The doctrine of Boerhaave, to treat burns on the antiphlogistic plan, by bleeding, purging, and rigid abstinence, influenced the practice of every medical school in Europe, down to the period when I first published my Essay. It is even now the practice in the Parisian school.

The following is taken from Mr. Richerand's Surgical Nosography. It is the third edition, and was printed in 1812; it may therefore be supposed to contain the present opinions, as taught in the Parisian school. The author informs us, that the classification of surgical diseases was not the only object he had in view, in giving this work to the public: he also wished to make known the present state of French surgery. He says, "I do not purpose writing what was known formerly, but that which is known at present; not to mark the progress of the human mind in the invention and improving of the

means, but to point out the necessary rules, and fix the actual station of the science; by which means we shall more easily perceive the further progress of which it is capable." He thus gives us the treatment of Burns.

" *On Gangrene by Burns.*—Whether this accident is the consequence of the application of caustic or of actual fire, its consequences are owing to the decomposition of the fibres, by their combination with oxygen and the disengagement of too great a quantity of heat. Caloric is a stimulant for every part of the body to which it is applied: no bad consequences arise from a moderate application of this power: if the body is in perfect health, a gentle re-action takes place, both useful and agreeable; but a too great quantity of this principle, forcing itself into the organs and increasing their temperature, is incompatible with life. The re-action excited by a too great quantity of heat causes an inflammation, the degree of which will be according to the greater or smaller capacity the burning body had for heat. Thus metals in fusion produce greater mischief than boiling oils, and these latter than boiling water.

" But a burn does not always proceed so far as to produce a gangrene: an inflammation is the most common consequence; the disorganization of the fibres is the worst state. The inflammations produced by burns are of the most painful kind, because they attack the cutaneous organs, which are of the most sensible structure. These inflammations terminate by resolution, or by ulceration, according to the intensity of the injury. Even in a compleat burn, where the caloric has destroyed the tissues, it is only the superficial parts, exposed to the too rapid introduction of this body, which are destroyed; for



beneath there always exists a very high degree of irritation, the consequence of which is an inflammation.

“ As there are three degrees of Burns, so are there three essential modes of treatment.

“ 1.—The continued application of refrigerants and repellants is sufficient, when the burn is superficial and slight. It is thus we prevent, in some measure, the inflammatory re-action of a part upon which boiling oil or water has been thrown, by keeping it plunged for many hours in a bath of icy cold water.

“ 2.—When, notwithstanding the free use of these means, inflammation ensues, it is necessary to treat it on the antiphlogistic plan.

“ 3.—In this stage, copious bleedings, low diet (*la plus severe*), cooling drinks, emollient applications, ought always to be had recourse to in extensive and deep burns. Parts reduced to an eschar detach themselves by suppuration from the subjacent organs; when these are thrown off, the parts underneath are exposed and sometimes form enormous wounds. The cicatrization of such wounds is very difficult: for the destruction of the skin is extensive, and the falling in of the edges of the wound to the centre is very slight. The cicatrix is always very extensive, and consequently very tender.”

The above extract from Richerand clearly shews us, that no change has taken place in the treatment of accidents from fire since the earliest writers on Surgery. Whatever advances the Surgical School of Paris has made in other parts of the science during the Revolution, it appears that in this they have been stationary. As the following case will enable us to see the effect of cold applications and copious bleeding, I shall present it to my readers.

“ A Woman, aged 28, fell asleep by her fire-side, in the year 13 (1804); the flames caught her cloaths, and the whole was on fire when she awoke. Aroused from her sleep by the pain caused by the burn, alone and without help, she could not disengage herself from her burning garments. The entire surface of the body was roasted, from the head to the feet. Her neighbours flocked in to her assistance, and took her to the Hospital of Saint Louis in this terrible condition. The surgeon in attendance covered her over with pieces of linen cloth, dipped in cold water in which some acetate of lead was dissolved: the cloths were kept well moistened with this solution, and plenty of it thrown upon her frequently; a copious bleeding was also practised. Notwithstanding these means, the swelling soon made its appearance, and occupied the whole of the cutaneous system, extending from the head to the feet; the blisters increased; the epidermis was almost entirely detached: that of the hands and feet formed a kind of gloves and boots. The true skin being thus laid bare, the pain became most acute; the parts formed into eschars were readily distinguished from those which were merely inflamed. The whole body was covered with compresses spread with cerate, and afterwards wrapped up in sheets dipped in emollient decoctions. But on the fifth day the patient fell a victim to the violence of the pain and inflammation.”

The above case, from Richerand's work, will illustrate to us the effects of Professor Dzondi's practice, both as to the external and internal means of treatment: for he says: “ If the inflammatory affection of the nervous system should require a particular treatment, it can be no other than the *antiphlogistic*.” The bleeding, therefore,



according to his opinion, would be perfectly right, as well as the cold water.

The following case, as related in the Monthly Magazine for August 1816, will point out to us the danger of attempting to cure burns and scalds by the application of cold.

“ At Holloway, [aged] six years and nine months, [died] Augusta, fifth daughter of Sir Richard Phillips. This lovely and interesting child fell a sacrifice to an accidental scald from boiling-water, rendered fatal by the vague state of medical science and practice. The immediate inflammation was reduced by cold applications of goulard-water, vinegar and water, within three hours; but an irretrievable indifference to the state of the stomach and bowels, and erroneous assurances of perfect safety, led, in a subject of previous florid health, to the commencement of convulsions in eighteen hours, which the means applied not conquering, terminated fatally in forty-eight hours from the time of the accident. Abating those solemn considerations which grow out of the profound afflictions of families, on the occasion of such domestic tragedies, we cannot avoid an expression of our astonishment, that, although the Colleges of Physicians and Surgeons have now existed two hundred years, no certain and unquestionable practice appears yet to be established in regard to a mere affection of the skin from a scald, and no chart of various accidents explaining those means of prompt and instantaneous relief which they generally require, has yet been issued by either of these learned bodies, or even by any accredited member of them. As a tribute to the public, arising out of much subsequent inquiry, we feel it our duty to make it known, that in

general, in cases of scalds and burns, renewed applications of a spirituous nature are to be preferred to aqueous fluids: thus, æther, spirits of wine, brandy, hollands gin, or turpentine, ought respectively to be preferred to more inert liquids; while the tendency to convulsions, produced by the peculiar effects of a scald or burn on the cuticle, renders it necessary to avoid the use of opiates, and to administer active purgatives. We feel it more incumbent on us to make these observations, because, within a few days, a fine boy has fallen a victim to a similar accident in the same village.”

I am totally unacquainted with this case, except as it appears in the above relation. The observations I shall make upon it are such as arise in my mind from its perusal, aided by my experience in observing the morbid actions of the system. The florid and healthy state of the subject at the period of the accident, together with the violent excitement produced by the stimulus of the scalding water being suddenly checked by the application of the cold lotions, produced such a torpor on these parts, as to affect the brain by sympathy; thus producing convulsions terminating in death. I am the more induced to draw this conclusion, having once seen a similar effect produced upon a child in scarlatina by cold affusion. The vague opinions, respecting the means to be used in such cases, are well portrayed in Sir Richard Phillips's remarks. Though I cannot adduce the sanction of the Colleges of Physicians and Surgeons, yet the following testimony of the Medical Society of Newcastle-upon-Tyne cannot fail of having great weight with their brethren. Their local situation has given them an opportunity of more experience in the conduct of such



cases, than probably has happened to the whole College of Physicians and Surgeons, united in the same time. The experience of this Society, for the last twenty years, is of the utmost importance to be recorded; for it is to be hoped, that the *safety-lamps*, introduced by Sir H. Davy, Dr. Clanny, and others, will considerably decrease their future opportunities of observation in such accidents.

“ *Newcastle, Oct. 29, 1816.*

“ MY DEAR SIR,

“ I feel much pleasure in being the instrument of  
“ communicating to you the following extract from the  
“ Minutes of our Society, by which you will observe the  
“ united testimony of my brethren in this town, in favour  
“ of the stimulating plan, first recommended by you, in  
“ the treatment of Burns. I believe, regulated by the  
“ principles you have laid down, it already has been, and  
“ will in future be, the means of diminishing the suffer-  
“ ings, and saving the lives of many unfortunate beings.

“ I remain, my dear Sir,

“ Your's most truly,

“ THOMAS LEIGHTON,

“ Secretary to the Medical Society of  
“ Newcastle-upon-Tyne.”

“ *The Members of the Medical Society of Newcastle-  
“ upon-Tyne, having understood that a second edition of  
“ Dr. Kentish's Essay on Burns is about to be published,  
“ are anxious to express to the Author their full approval  
“ of the principles and practice enjoined in his work.  
“ That such practice having stood the test of twenty*

“ of surgeons, from the circumstance of my father  
“ having been gradually led (by repeated experience of  
“ the comparative inefficacy of the ordinary modes of  
“ managing those dreadful accidents which arise from  
“ the explosion of Hydrogen Gas in the Collieries) to  
“ the adoption of a plan of treatment somewhat similar  
“ to your’s. I do not know what originally induced him  
“ to select the Oil of Turpentine as an external applica-  
“ tion, but for many years he was in the habit of using  
“ it very freely. At first, I believe, he employed it  
“ cautiously, and largely diluted with common Oil; but,  
“ as his experience of its effects became more exten-  
“ sive, he gradually increased the strength of the dress-  
“ ing, till at length he used it pure. Experience had  
“ also shewn him, that, if applied longer than two or  
“ three days, the dressing was productive of irritation,  
“ and consequently of injury. The outward application  
“ of the Turpentine was conjoined with the internal use  
“ of nutritious diet, and the liberal exhibition of Opium.  
“ This he gave most commonly in the form of the  
“ Confect. Opii. After the first few days, the stimu-  
“ lants were discontinued, and mild dressings applied.  
“ Under this system of management, I can very well  
“ remember scores of severe burns get well, and in a  
“ time so short as to afford a very satisfactory contrast  
“ with the results of the common modes of treatment.  
“ When your book appeared, it gave my father very  
“ great gratification, and led him to adopt the whole of  
“ the methods you recommend.

“ You must be aware that I do not give you this  
“ account to detract, even in the slightest degree, from  
“ the merit or originality of your publication, but on the  
“ contrary to afford, if needful, an additional testimonial



“ to the value of the practice you inculcate. I have  
“ reason to believe that several surgeons, in different  
“ parts of the kingdom, were in the habit of using the  
“ Oil of Turpentine as a dressing in burns; but it is to  
“ you, alone, that we are indebted for an account of the  
“ practice, regulated in its employment by the applica-  
“ tion of certain determinate principles, so limited and  
“ guarded as to prevent the possibility of error or injury,  
“ and confirmed by extensive experience.

“ I do not send you any cases in detail, illustrative of  
“ the peculiar merits of your mode of practice, as I should  
“ imagine that most surgeons, who are placed in the  
“ situations where the accidents demanding its use are  
“ most frequent, have been led, by a knowledge of its  
“ superior efficacy, to its adoption. I have known it  
“ employed in some hundreds of cases, of all the various  
“ degrees of severity, from the slightest to the most  
“ violent; and the result of every trial has been a most  
“ decided conviction of its superiority to every other  
“ mode of treatment hitherto recommended.

“ Were it not for the well-known fact of the slowness  
“ and hesitation with which we change long established  
“ and cherished opinions, and that the generality of  
“ surgeons have but few opportunities of making com-  
“ parative observations upon a sufficiently extensive  
“ scale, I should be surprized at the scepticism which is  
“ still felt by some most valuable members of our pro-  
“ fession, as to the relative superiority of your method.  
“ And after all, I can only account for their doubts by  
“ supposing that they have never had a fair opportunity  
“ of trying it themselves, and that they have been pre-  
“ judiced against it by having seen it tried by others,  
“ who knew little else of the plan besides the name.

“ care the case has been carried beyond that period, but  
“ has from the dreadful extent of the injury, ultimately  
“ terminated in death.

“ The circumstances I mentioned in the beginning of  
“ my letter, have prevented me from taking that more  
“ extensive survey of the controversy relating to the  
“ management of these accidents, which I originally  
“ intended; but I have been little disposed to regret the  
“ omission, as the more I have reflected on the subject,  
“ the better I have been satisfied that your practice needs  
“ no additional vouchers, and that it may be confidently  
“ left to make its way by its own intrinsic excellence.  
“ If, however, your work should not be completed, and  
“ you should think it advisable to employ my name, the  
“ substance of this letter is at your service, to appear as  
“ a note to any suitable part, or to use as you may deem  
“ fit; and if there should be any other point on which  
“ you may wish me to write, have the goodness to  
“ inform me. Pray excuse the haste which is visible in  
“ every part of this sheet; as, although it should have  
“ been sent so long since, I have been compelled to  
“ write in a hurry at the last.

“ Your’s most sincerely, &c.

“ JOHN BADLEY.”

With this evidence of Mr. Badley’s, in corroboration of the principles I have advanced, I shall close the subject. Having completed the task I purposed, viz. that of giving an account of what my practice was, I trust therefore, I shall not be misunderstood; for my work may now be consulted, which before was difficult, as it had been long out of print.



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# ESSAY ON BURNS, &c.

## *PART FIRST.*

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### INTRODUCTORY CHAPTER.

ANALYSIS OF AIRS.—LAVOISIER'S EXPERIMENTS.—PHENOMENA OF COMBUSTION IN GENERAL.—WATER, ITS DECOMPOSITION.—EXPERIMENTS.—PRODUCTION OF HYDROGEN GAS IN MINES.—OF COMBUSTION IN MINES IN PARTICULAR.—THE EFFECTS OF THESE PHENOMENA NOT PREVIOUSLY NOTICED AS HAPPENING TO MINERS.

**T**HE object of the following Essay is to explain the effects of Fire upon the human system, and it was originally intended to investigate those in particular which happen from the combustion of large collections of hydrogen gas in mines; it was therefore not irrelevant to the subject to take a concise view of the phenomena attending these explosions, which are the causes of such terrible accidents to miners. Such phenomena I shall again recount. As explosions in mines are altogether dependent upon the doctrines exposed by pneumatic chemistry, it will be necessary to explain the nature of the different gases by which they are produced.

The atmosphere, which, formerly, under the denomination of the air, was supposed to be a

simple element, has, by the indefatigable researches of modern chemists, been analysed in so clear a manner, as to leave no doubt of its being a compound mass. It is capable of taking up a variety of different substances in solution; but its most common composition, or what may be termed its healthy state, consists of two elastic fluids, the one greatly conducive to all the purposes of life and to flame, the other equally noxious to both.

Lavoisier illustrated this fact by the following experiment. Having placed a certain quantity of pure mercury in a retort, adapted to a bell-glass, which inclosed one hundred cubic inches of common air, he kept up in his furnace a constant fire, of such a force as to keep the mercury almost always at the boiling point. On the second day small red particles began to appear upon the surface of the mercury, which gradually increased in size and number for four or five days. Convinced that the calcination of the mercury after that time did not go on, he extinguished his fire; and, when the vessel was cooled, he found in his bell-glass, instead of one hundred cubic inches of air, only eighty-six; consequently there was a loss of fourteen cubic inches of air. Fourteen cubic inches of air weigh seven grains; the red particles of the calx of mercury being carefully collected, these had an increase of weight of seven grains, the exact weight of air which appeared to be lost. The eighty-six cubic inches of air, remaining in the bell-glass after the calcination, were examined, and found to possess the following properties. An animal being put into it, was suffocated in a few minutes; and a lighted taper plunged into it, was extinguished, as if it had been immersed in water. This air has been differently denominated



by chemists, but it is now generally known by the term azotic gas.

Lavoisier's second experiment was to take the calx of mercury, weighing ninety grains, the product of the last process, and put it into a glass retort, fitted to a proper apparatus for receiving aerial products. Having applied a much stronger fire than in the last experiment, he observed that at first, in proportion as the calx of mercury became heated, the intensity of its colour became augmented; but soon after the calx began gradually to decrease in bulk, and in a few minutes its red colour altogether disappeared, and the calx was converted into fluid mercury. Fourteen cubic inches of an aerial fluid passed over into the recipient; these fourteen cubic inches of air weighed seven grains, the exact weight of the air consumed by the calcination of the mercury, in the first experiment; and the calx of mercury, reduced to a metallic state, being examined, had lost in weight seven grains, the exact weight of the air obtained. The properties of this air were as follow: an animal being placed in it became remarkably lively; a lighted taper burnt in it with a dazzling splendour; and charcoal, instead of consuming away quietly, as it does in common air, burnt with a flame, attended with a decrepitating noise, and threw out such a brilliant light, that the eyes could scarcely endure it.

This species of air was discovered nearly at the same time by several learned chemists, who denominated it differently, according to their own ideas respecting some of its various properties. It was termed *vital air* by Lavoisier; and, from the great influence it has over the phenomena of life, it was expected by some sanguine philosophers, that it would produce a greater revolution

in medicine than any which had happened since the time of Hippocrates. As most of the acids owe their origin to the combination of certain substances with this vital air, it is now generally regarded as the acidifying principle, and designated by the term *oxygen gas*.

These are the experiments by which Lavoisier analysed the atmosphere; and it tends to give them additional weight, when he informs us, that he synthetically recomposed an elastic fluid, in all respects similar to the atmosphere, by combining thirty-six cubic inches of azotic gas, and fourteen cubic inches of oxygen gas. These experiments prove the compound nature of the atmosphere, but do not give the exact proportion of each part; for the attraction of mercury to the base of oxygen gas is not sufficient to overcome all the circumstances which oppose its union. These obstacles are the mutual adhesion of the two constituent parts of the atmosphere to each other, and the elective attraction which unites the base of oxygen gas with caloric. In consequence of these circumstances, when the calcination ends, there is still a portion of oxygen gas united to the azotic gas, which the mercury cannot separate. But, from repeated and varied experiments, Lavoisier concludes, that the ordinary proportions of the atmosphere in our climate are twenty-seven parts of oxygen gas, and seventy-three parts of azotic gas. The relation of the above experiments demonstrates to us the compound state of our atmosphere; and we thus perceive, that nature has provided an inexhaustible store of oxygen gas for all the purposes of life, flame, and acidification.

Having shewn the compound state of the atmosphere, by which we see the immense



provision of oxygen gas, which forms one of the constituent parts of the phenomenon we wish to explain, we shall now proceed to investigate how the other principle, viz. the inflammable air, is generated.

Water, which for thousands of years was regarded by the ancients as a simple element, has, by means of modern chemistry, been decomposed. This fact will be explained by the following experiment.

Mr. Meusnier took a gun barrel, into which he put some pieces of iron, flattened by a hammer; he weighed the whole with a scrupulous exactness; he then luted the gun barrel, to secure it from the contact of the fire; it was placed in a furnace, but so inclined that water would easily run down it. He adapted to the upper extremity a funnel, containing water, from which it could only escape into the gun barrel drop by drop. This funnel was closed at the top, so as to prevent any evaporation. At the lower extremity vessels were placed, so as to receive any aerial product. The gun-barrel was now rendered red hot, and the water passed into the funnel drop by drop; an astonishing quantity of inflammable air was quickly obtained. Having removed the luting, the gun-barrel, with its contents, weighed heavier than before. The acquired weight of the gun-barrel, being added to the weight of the inflammable air, was precisely the weight of the water expended in the process. The iron wire found in the gun-barrel, when the process was finished, resembled in every respect iron that had been consumed in oxygen gas, forming a real oxyd of iron. In this experiment, the oxygen of the water combined with the iron, forming an oxyd; whilst the other part of the

water combined with heat and light in the furnace, and escaped under the form of inflammable air, now termed hydrogen gas, or the base of water.

This was the first experiment by which water was decomposed, and which induced Lavoisier to make that important experiment on which the pneumatic chemistry is founded, viz. the forming of water by the combustion of oxygen and hydrogen gases; thus synthetically establishing the truth of his hypothesis. Messrs. Meusnier and Lavoisier performed this experiment under the inspection of the Academy of Sciences at Paris, by which they ascertained, that water is composed of eighty-five parts of oxygen and fifteen parts of hydrogen, in every hundredth part of the fluid.

The fact of water being decomposed having been thus ascertained, it will be easy to account for the collections of hydrogen gas in mines. Water filtrating through the different strata of earth may readily be decomposed, as it comes in contact with pyrites, metals, or coal itself. From hence it will be collected in old worked-out mines, or other parts of mines, where they are working. Some times it happens that the miners perforate a barrier which separated them from what they term a waste, or a part from which the coal had formerly been taken. From whatever variety of causes the collection may take place, the effects are the same. The simple mixture of the hydrogen of the mine with the oxygen of the atmosphere is not attended with any dangerous effects; if, therefore, a good current of air be made to pass through the mine, this dangerous fluid might be carried away as fast as it is generated. When this precaution is not attended to, and a combining medium is at hand, which, in the



instances we are contemplating, is generally a small candle with which the miners are supplied, the rapid combination of the hydrogen gas in the mine with the oxygen gas of the atmosphere produces the most fatal effects. The heat and light which kept these gases in an aeriform state, are in an instant disengaged under the appearance of a vivid flame, and form a medium of disengaged fire.

This fire attacks every thing it comes in contact with; sometimes the horses, as well as the miners, are burnt to death, and die in the most excruciating torments. Can there in imagination be any thing more horrible, than to be thus engulfed in pure elemental fire? Yet even the horror of this situation is sometimes increased; for, when the collection of the hydrogen gas is great, the vacuum caused by the rapid combination disturbs the equilibrium of the atmosphere, so as to produce the most extraordinary and calamitous effects. Sometimes the air rushes down one aperture (or shaft, as it is termed) with an inconceivable rapidity, and sends up large pieces of timber by another, as if propelled from the mouth of a piece of ordnance. In fact, the materials of both these phenomena are the same, the order only of combination being inverted. With gunpowder the oxygen gas is rendered solid, in the form of saltpetre; the hydrogen gas is embodied in the sulphur and charcoal, the fire from the flint liberates them, and loosens their bonds, upon which they resume their gaseous and elastic form of oxygen and hydrogen gases.

Such are the phenomena attending the explosions of coal-mines. To remedy the pernicious effects of the fire applied to the miners from this cause, was the original motive of the author.

Many thousand lives have fallen a sacrifice to this species of injury, in the works on the rivers Tyne and Wear, but no record is to be found by which the practitioner can gain any information respecting the treatment of burns occasioned by these explosions. This being the fact, it was a sufficient inducement for me to bring before the public the observations I had made on an extensive scale; by which those who follow me will have some surer principles to guide them in their practice, than any which I have hitherto been enabled to discover.

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## CHAPTER II.

PRACTICE AND OPINIONS OF THE OLDER  
AUTHORS.--HEISTER.--VAN SWIETEN'S COM-  
MENTARIES.—PRACTICE AND OPINIONS  
OF THE MODERNS.—BENJAMIN BELL.—  
ENCYCLOPÆDIE METHODIQUE.—MEDECINE  
ECLAIRÉE.—PRACTICE AND OPINIONS OF  
VARIOUS PRACTITIONERS.

**I**T is necessary that a medical author, who writes for the information of his brethren upon any particular subject, should be well acquainted with the labours of his predecessors, more particularly with those works which bear upon the point of science he means to investigate. From such knowledge and retrospection, he must be induced to form his opinion of the necessity of his undertaking. If the subject be well understood, and



there be a perfect accordance, both in theory and practice, as to the general treatment of any disease, it would be superfluous to discuss the subject. But, on the other hand, where the most opposite and incongruous opinions are supported by characters of the greatest celebrity in our science, we may naturally conclude that the subject is not yet thoroughly understood. The opinions I shall offer are given to the world to be canvassed, and certainly will not be valued for more than they are worth, I shall therefore take the liberty of bringing in review the opinions of medical writers upon this subject, as far as I have been enabled to collect them. As the authors who have written systems generally give the result of what they have been able to collect from their predecessors, as well as from their contemporaries, and from their own individual knowledge, I shall bring them forward in their own words. The following is taken from Heister.—(*Vide Heister's Inst. Chirurg. tom. 1. fol. 330—333.*)

“Burns may not improperly be divided into four classes, or degrees; the first and least appears to be, when the part affected feels pain, attended with redness and heat, and after a short time shows a rising blister. The second is, when blisters rise, with great pain, immediately after the burn. The third is, when the skin, and the fat and flesh under it, are so much burnt as immediately to exhibit a scab. The fourth and last is, when the burn has been so violent as to have destroyed every thing to the bone. The third degree resembles gangrene; the fourth sphacelus; whence it is further evident, that burns very nearly resemble inflammations, and that each degree of them is marked by nearly the same indications.”

“The resemblance of burns to inflammations is shewn, not only in the degrees, but in the methods of cure ; for in cases of slight, or burns of the first degree, resolvent applications are by far the best, such as we have directed in cases of inflammation, and of which two kinds are chiefly to be preferred, viz. astringents and emollients. Among the gentle astringents, common spirit, or rectified, or even camphorated spirit of wine, may be reckoned, provided the injured parts be dipped into it, or carefully bathed with rags, moistened in the spirit. Nearly the same effect is produced by litharge, dissolved in vinegar, (Goulard’s extract ;) the liquor of pickled cabbage, (sour-cROUT ;) or a decoction of oxycrate, (vinegar and water, with sometimes a little honey,) with salt applied hot, and as frequently as possible, in the same manner as the spirits before recommended. Oil of turpentine also is frequently of advantage, if it be early applied. Lastly, it is not improper immediately to expose the burnt part of the body, as a finger, or a hand, to a candle or a fire, and to hold it so exposed, as near and as long as the pain will allow ; or to bring it near and to remove it, alternately, till the sensation of heat and pain is abated. For thus, not only the stagnated blood is, by the vehemence of the fire alone, reduced to its former state, but blisters also, with the other severe symptoms, are most effectually prevented, and the first degree of a burn is often without difficulty cured.”

“An almost opposite, but equally effectual method of cure, is that which has recourse to emollient applications. By these, whatever is contracted and wrinkled up in the fibres and small vessels is softened ; the natural passage and circulation of the blood through them is restored ;



and thus the fatal consequences which might have been apprehended, are obviated."

"Water, moderately heated, as the part affected will bear it, is of considerable use, if a folded linen cloth dipped in it be applied to the burnt part, and the moisture be added to it every now and then, till the sense of heat and pain is by degrees abated."

"But, 2dly, this hot water is more effectual, if marsh-mallow, mallow, mullein, linseed, seeds of fenugreek, quince, or other similar emollients, have been boiled in it.—3dly, Emollient cataplasms, made either of the herbs above recommended, or of any other obvious poultice, and applied as hot as they can be borne, are found of great advantage: for scarcely any poultice can be found which does not possess some emollient quality.—4thly, Emollient oils, as of bruised sweet almonds, olive, white lillies, henbane, or others, are valuable in this way. These are applied either upon linen cloths, or often with a feather, applying them frequently, so that the part may not become dry.—5thly, Mynsicktus's burn ointment must not be omitted, which is an excellent lenitive; it is made of olive or linseed oil, mixed with white of egg, and applied in the usual way. The mucilage of quince (seeds) is also of remarkable efficacy."

"But, of the above-mentioned applications it must be observed, in general, that they are of little or no use unless frequently repeated."

"When this second degree is a little more violent, and affects a great part of the body, it seems necessary, in order to guard against exulceration, ugly scars, or even gangrene, to *take away blood*, in proportion to the inflammatory degree of the burn, in some cases *even to fainting*, and

afterwards to prescribe powerful purgatives. The external applications must be the same as before."

"In infants, for whom bleeding is less proper, a revulsion must be procured by repeated purgings. For the rest, as in other severe wounds and inflammations, great attention ought to be paid to the diet; the thinnest drinks and ptisans ought to be used: for every thing which is heating, or taken immoderately, is usually fatal, by increasing the heat and pain. But nothing is more efficacious in cooling the heat of burns, than the directions of the famous Sir Kenelm Digby, to give ten or twelve drops of spirit of salt (muriatic acid) every now and then, either by itself, or dropped into other drinks."

A person totally unacquainted with the subject, who had never treated a case of burn, would acquire no certain information from Heister's Institutes of Surgery; his judgment would be confused by the variety and opposite nature of the remedies recommended. There is no principle laid down by which his mind could be aided in drawing any conclusion. Whatever application he should chance to make from this medley of means, if his patient recovered, he probably would become a strong advocate, a stickler for the astringent or emollient applications; for if a patient recovers, whatever be the treatment, whether good or bad, we easily flatter ourselves it is owing to our superior merit in conducting the disease. It falls to the lot of few to have a sufficient number of cases to appreciate duly their own blunders. Of this few who are so fortunate, fewer still have the candour to confess their mistakes; yet it is this class who, in a super-eminent degree, have it in their power to instruct their brethren.



These remarks are confined to the external applications made to burns. With respect to the medical treatment of accidents of this class, our observations do not apply, for there is a unity of principle throughout. If the accident be severe, and medical means are required, *frequent and large bleeding*, even to *fainting*, is recommended, with *very effective purges*, a *rigid diet*, and *cooling ptisans*: for, says Heister, every thing which is heating is *usually fatal*. This is the only part in which our author is decisive.

I hope, in a future part of this Essay, to shew, both from my own experience, and the undoubted testimonies of the most able and discriminating professors of the age, that this practice is the most pernicious that could be had recourse to, and that a mode diametrically opposite should be pursued.—(See a case, communicated by Dr. Felix, in the 14th volume of the Medical Journal, page 398, in which his infant, aged seven months, took a great quantity of stimulants, with the happiest effect.) But I shall cease further remarks at present, as other authors, besides Heister, must come forward in their own words.

Van Swieten, who spent twenty years of his life in commenting on the Aphorisms of Boerhaave, treats this subject as follows :

“SECT. CCCLXXVI.—*If actual fire, or any thing which conceals fire, is applied to our bodies, there follows a destruction of the small vessels in the part, and an extravasation of their humours, varying according to the difference and duration of the cause, and of the nature of the affected part.*”

“But the different nature and action, or use of the affected part, will again make a difference in the effects of fire. Those smiths, who are daily employed in the making of anchors, have the

palms of their hands extremely hard and insensible, like horn; insomuch that they are capable of holding burning coals, or even hot iron from the furnace, without danger; but the same smiths, when they lie sleeping by the fire-side, after they have been tired by their day's labour, have the skin of their legs often burnt, and raised into a blister, by a small particle of such fire. When a citizen of the Hague was blowing with his mouth into a musket, the piece being charged, unfortunately took fire, the man not knowing it was loaded; and by this accident his palate, gula, gums, and tongue, were miserably burnt, insomuch that he was not able to swallow any thing for the space of eighteen days, though bleeding, and other approved remedies were used, and the dead parts separated from the living, which being extremely painful and sore, created much misery to the patient, till at length some fragments of bones being separated from the palate, he did well, and gained the better of death, after a hard struggle. But it is very evident that a burn would be much less dangerous and troublesome, provided the hand were to be burnt with gunpowder, instead of the mouth and gula."

"SECT. CCCLVII.—*The different degrees of these several effects from burning, resemble those observed from the first and slightest degree of an inflammation, till it degenerates into the worst, or most severe sphacelus.*"

"SECT. CCCLXXVIII.—*Hence the phenomena or symptoms, the diagnosis and prognosis, are the same in both.*"

"SECT. CCCLXXIX.—*But in the cure also there is no difference; and more especially the antiphlogistic drinks, proper for inflammations, are always necessary in turns.*"



“ For in the same manner, as no general method can be prescribed for the cure of inflammation, but the means are to be varied according as it tends either to resolution, suppuration, gangrene, or schirous ; so also in burns, a very different method of treatment is required, when it stops within the limits of a resolvable inflammation, than when the fire has destroyed, or converted the part into gangrenous or dead escars. In the following aphorisms we shall therefore prescribe the method of cure proper to each degree of burning, by which it will appear, that this disorder corresponds very much to the curative indications, enumerated in the history of phlegmons; insomuch that there is but one remedy that can be universally recommended in all the species of burns, namely, the use of a thin *antiphlogistic* or *cooling drink*. For there is a degree of inflammation which accompanies even a slight burn. But in more intense burns, especially if a large part of the body has been injured, all these *remedies will be convenient*, which we before recommended for the cure of a violent phlegmon, and more especially *bleeding, repeated* according to the nature of the case, with *antiphlogistic purges*. By these means, Hildanus happily cured the servant of a dyer, that fell into a copper full of hot dye, which was not yet scalding ; and by the external application of the best topical remedies, he cured this slight scalding of the whole body ; which yet appears from the history not to have exceeded the limits of a resolvable inflammation, except in a few parts of the body, which touched the oak chips, and other hard materials lying next to the bottom of the copper, to which part a different method of treatment was used, as Hildanus informs us. At least it is

evident, from this instance, how serviceable those means may be for the cure of burns, which were before recommended for the cure of a resolvable inflammation."

" SECT. CCCCLXXX.—*Burning, or scalding, within the limits of a resolvable inflammation, is to be treated with such remedies as preserve, or, as it were, pickle the juices, and put them into motion; and by such things as open and preserve the vessels; and this is performed by a moderate degree of fire, by fomentation, and cataplasm, by washed butter; or, lastly, with spirit of wine, and a little vitriol.*"

" If a burn has injured a small part of the body, there will be no necessity to disturb the whole by bleeding and cooling purges, &c. for in that case it may be sufficient to treat the part itself affected with topical remedies. When the burning has been so slight as only to cause a resolvable inflammation in the part, the cure is then easy enough, even by most of the different remedies which are kept in families for that purpose. But what seems not a little surprising is, that even the best surgeons should recommend medicines of opposite virtues in these accidents, namely, emollients and astringents, *attractives* and repellants, &c. &c. &c."

" Thus Parey recommends the juices of house-leek, lettuce, plantain, &c. mixed up with the white of an egg; and in the same place, and for the same *disorder*, a mixture of clay and vinegar, or writing ink, mixed with oxycrate, or roach alum dissolved in water; and observes, that the acrid bulbous roots of onions, beat to a cataplasm, with a little salt, are applied with very good success. I have also observed several other things applied in these cases, to the great relief of the



disorder, provided the application of them is frequently repeated. And it is a caution given almost by all surgeons, that, at the beginning, the remedies applied to the burnt part ought to be frequently renewed, until the pain is abated : or, as Purey expresses it, till the heat or fire of the part has been drawn out."

" When the wife of Hildanus had several times dipped her hand up to the wrist, inadvertently, into boiling soap, immediately afterwards a violent pain followed, not only in the hand, but also throughout the whole arm ; but presently afterwards the soap was washed off with warm water ; and then the injured part was anointed with a liniment, made up of raw onions, salt, soap, oil of almonds, and oil of roses, mixed together. The arm was also anointed with oil of roses, and the affected parts invested with a bandage, dipped in vinegar and water. And he adds, that he often repeated these means, with good success ; that no ulceration of the skin followed so violent a scald, except a small pustule in the thumb, and another in the fore finger, which were easily cured with a little unguentum basilicon only. In another case, he says, he renewed emplasters four times every hour, for the first day ; and by these means drew out the greater part of the fire."

" Thus, therefore, there seems to be many remedies capable of curing this degree of burning, provided they are such as keep the stagnating humours from corrupting, and put them into motion, while, at the same time, they preserve the continuity of the vessels, and render them pervious."

" It may be asked, whether fire, applied to any part of the human body, does not remain united

to it for a time ; and whether it may not be *extracted*, by certain *remedies*, in the same manner as the *freezing spiculæ* are drawn out of *frozen bodies* by the application of *snow* and *cold water* ? At least it is certain, that barely by a prudent application of *fire*, the *pain* is abated in the burnt part, and at length totally removed. Hence, FERNELIUS has very justly pronounced, that fire itself, applied near to the burnt part, is its own antidote, to drive out the fire of the burnt part, by which the pain is abated ; and he adds, that some remedies, applied to the parts, entice out the fire. Thus he says, that the leaves of leeks and arum ; or wake-robin, make a present remedy for a burn ; and, soon after, he adds a numerous catalogue of medicines, which serve for the same purpose, though their medicinal virtues are very different from each other. I have frequently seen that the mere application of warm water, or anointing with *unguentum populeum*, or the like, has relieved the pain in the burnt part ; and, when the pain has increased again in a little time afterwards, it has been a second time removed by the application of linen cloths, moistened with warm water, or by renewing the unction with the same liniment ; and thus by the repeated application of the same remedies, all the pains have by degrees vanished."

" But spirit of wine, we are assured by Sydenham, is preferable to any other remedy as yet known, namely, if linen rags are dipped and applied to the burnt parts, and the application of them repeated till the pain excited by the fire is entirely removed ; and afterwards the same application he would have repeated only twice in a day. It is to be here observed, that this great



man recommends the frequent application of the same remedy in the beginning of this disorder. It will be also equally serviceable to add a little vitriol to the spirit of wine, or else alum, or the like astringent and repelling substances, which have been recommended by Parey and others. Perhaps these remedies exert their efficacy by preventing the blood from passing into the smaller vessels, and by constringing the vessels, so as to propel their contents from the smaller towards the larger capacity of the tubes, and by that means resolve the inflammation there seated. But all these remedies, however celebrated, are only serviceable where the burning has produced a resolvable inflammation; for if the vessels have been so far destroyed, or their contained juices evaporated, to such a degree, that there is no room to expect a resolution of the concreted parts, nor a possibility of restoring the stagnant juices to their proper motion, in that case another method of cure is required, as we shall explain in the following aphorisms."

"SECT. CCCCLXXXI.—*A burn, which tends to a gangrene, which may be known from the skin being already turned into a crust, or else eroded and elevated into blisters, is to be treated as an inflammation of the same nature, namely, by fomentations and cataplasms of emollient and digestive remedies.*"

"But since the burning cause does not always act with the same violence upon every point of the flesh which it touches, we therefore frequently find that the inflammation is in some part resolvable, and in others not at all; whence different remedies are to be applied to the different parts, according to the nature of the circumstances; as

for example, when scalding water falls upon some part of the skin, that part which it runs over first will be injured more than the adjacent skin which it passes over afterwards. Hence, in that case of the dyer's servant, who fell with his whole body into water almost scalding, Hildanus anointed almost the whole body with a mixture of salt, soap, crude onions, &c. formed into an ointment; but to some certain parts, where the burn penetrated more deeply, the most emollient remedies. But *bleeding, cooling purges*, and the use of diluent medicines, can never be prejudicial, even though a resolution can be hardly expected in the most violent burns; since by these means, speedily applied and discreetly repeated, even an incipient gangrene is often happily cured, more especially when the face is burnt, from whence a disagreeable scar or disfigurement might be feared as long as the patient lives, or even sometimes blindness itself, when the eyes, or their adjacent parts, have been thus injured. A misfortune of this nature once happened to the celebrated author of these aphorisms."

I wish the reader to pay particular attention to this case of Boerhaave's. It is a compliment to his integrity, that he put in practice upon himself those principles he would have followed in the treatment of another. But, when contrasted with the case of Mr. Hopper, (*vide* third mode of treatment) the perfect rapid cure of the one, with the unsightly scar and tedious suppuration of the other, can leave no doubt, in an unprejudiced mind, of the superiority of the principles laid down in this Essay.

"When, by the bursting of Papin's machine, or digester, the most scalding water flew into his



face, and penetrating through his clothes, miserably scalded his arm; his whole face was in a little time blistered, and his eyelids so much swelled as totally to obstruct his sight, insomuch that he could not distinguish the light of a candle; he immediately ordered himself to be bled, *ad deliquium*; and the next day caused phlebotomy to be repeated; and afterwards took a pretty strong purge, even though he was reduced nearly to a state of fainting by the weaker purges. He took care to have his face anointed only with *unguentum nutritum*, and covered with *emplastrum ex lapide calaminari*. After these *profuse evacuations*, the tumour of the parts subsided; and by the use of a thin diet, and plentiful drinking of cool liquors at the same time, the cure of this dangerous scald was so happily advanced, that in eight or nine days time he appeared again in public, with his eyes saved from so great a danger, for the great benefit of mankind in general. But yet an *unsightly scar remained in his arm, after a tedious suppuration*, for there the scalding water, insinuating into the clothes, continued to be applied for a longer time to the skin."

If the aphorisms of the learned Boerhaave, and the commentaries of his laborious successor, were read to acquire information on the treatment of burns, the reader must quit the investigation with increased doubt: for he is told he may use *emollients*, or *astringents*, or *attractives*, or *repellents*, &c. &c. &c.

I trust I have not wantonly said, that the ancients have not left us any rational guide, or principle, upon which our practice could be founded. Can any reader see these quotations without agreeing with me in the assertion?

There are only two rules upon which they speak with any decision, viz.—externally, to renew the plasters frequently, even every quarter of an hour, for the first day ;—internally, or medical means, strong purging, low diet, and excessive bleeding.

Now these two *certain rules* I have found not only perfectly useless, but the latter of them very pernicious. To the latter practice I attribute the *tedious suppuration* attending Boerhaave's accident ; nor was the treatment he pursued necessary for the scald in his face, as the following will shew :—"The contents of a whole saucepan of boiling butter was accidentally dashed in a young woman's face, but being fortunately upon the spot, I immediately applied the *oleum terebinthinæ*, by means of a brush of feathers, keeping the eyelids closed for about ten minutes or a quarter of an hour. I afterwards directed a folded linen rag to be moistened with the same, and kept upon the part until the burning sensation had subsided. The result was favourable : there was only a small vesication upon the neck, which was overlooked, and therefore had not had the advantage of the lotion."—(*Vide Vol. xx. Medical Journal*, p. 491.) The heat of the boiling butter would be nearly equal to the water of the digester, (oil boils at 600 ;) yet the result of these two cases was very different, for it does not appear that any thing further was done for this case than what I have related.

The opinions detailed by Heister and Van Swieten may justly be regarded as an epitome of the notions the ancients possessed upon this subject.

In pursuance of my plan of bringing into view the contradictory opinions of writers on this subject, I shall now bring forward the



modern authors. In the third edition of Benjamin Bell's System of Surgery, published in the year 1789, he treats this subject as follows :—

“ Burns, which do not destroy the cuticle, and which irritate the skin only, act nearly in the same manner as cantharides and other vesicantia. The irritation which they excite produces an increased action in the exhaling vessels of the affected part, by which vesications are formed, in extent and number proportioned to the violence of the cause. In every case of burn, the pain is severe ; but in general it may be observed, that it is more considerable where the skin has been merely much fretted or irritated, than where such a degree of heat is applied as to destroy it entirely. In deep extensive burns, mortification sometimes takes place to an alarming degree, very soon after the injury is inflicted ; but, for the most part, the symptom we have most to dread is inflammation. The pain and irritation which burns excite, are, in some instances, so violent, that all our efforts are apt to fail in preventing them from inducing the very highest degree of inflammation. And when the surface of a burnt part is extensive, the effects of this inflammation are not confined to the spot which has more immediately suffered: they are apt to excite fever ; and, in many cases, such a degree of torpor is induced, as at last ends in death.”

“ An abatement of pain may be procured by the application of remedies of very *different*, and even of very *opposite* natures. By dipping the affected part in *very cold water*, and keeping it for some time immersed in it, the pain will often be rendered very supportable ; while, on the other hand, a considerable degree of ease may be pro-

cured by plunging the injured part suddenly into *boiling water*, or any other fluid of nearly an equal degree of heat. Emollients are often employed, and in some cases they procure immediate relief; but in general, astringent applications prove much more successful. One of the best applications to every burn of this kind, is strong brandy, or any other ardent spirit. It seems to induce a momentary additional pain; but this soon subsides, and is succeeded by an agreeable soothing sensation. It proves most effectual when the parts can be kept immersed in it; but when this cannot be done, they should be kept constantly moist with pieces of old linen soaked in spirits. The *acetum lithargyrites*, a solution of *saccharum saturni*, or Goulard's saturnine water, make useful applications for the same purpose; and, as a proof that it is the astringency of the remedy which the effects result from, the same benefit is derived from a strong solution of alum, or even from common ink."

Taking the above extract from the modern work of Mr. B. Bell, we may suppose that it contains a summary of the opinions of our contemporaries; from which we are led to conclude, that no advancement in respect to any certain principle in the treatment of this accident, had been made up to the period when his system was written. Owing to the advancement of pharmacy, the farrago of things recommended by the ancients has been discarded, but the contradictory means remain as before. Thus we observe heat, and cold, emollients, and astringents, &c. &c. The external means are essentially the same as recommended by all the older writers. Let us now inquire as to the medical treatment of such disorders.



Bell says—"In this manner, all such burns as we are now treating of may in general be cured, excepting where they are so extensive as, by the irritation which they produce, to excite much inflammation and fever. In such circumstances, *blood-letting, and other remedies, adapted to the particular symptoms, must be advised.*" There can be little doubt when blood-letting is advised, that the other remedies would be purging, and what is generally termed the whole of the antiphlogistic regimen; in which would be included cooling drinks, aperient ptisans, and low diet. Thus the general tenor of the medical treatment exactly corresponds with that of the ancients. From what has been adduced, it clearly appears, that the external means of the moderns are as vague as those of their predecessors; and that, in the medical treatment, the same principles and modes are now in use, as were formerly resorted to.

It will be desirable to compare the opinions maintained in our own systems of surgery, with those of our neighbours on the continent. I shall therefore translate the article *Brulure*, from the French *Encyclopedie Methodique*, edition, 1790. It is not necessary to apologise for this, as, independently of the work not being readily available to many of my readers, my plan would not have been complete without advancing such documents for the necessity of my undertaking. The surgical part of the *Encyclopedie* was compiled by Mr. de la Roche, physician to the regiment of Swiss Guards, member of the College of Medicine at Geneva, and of the Royal Society of Medicine at Edinburgh; and Mr. Petit Radel, doctor regent of the Faculty of Paris.

"BURN, a wound more or less superficial, occasioned by the contact of some substance heated

beyond the point which the body could bear, without destroying its organization. Burns have a different appearance, according to the degree of violence exerted by the body which produced them, and according to the kind of body which caused such an effect. Those which have only irritated the skin, differ essentially from those which have corroded and destroyed it; and these last have a different aspect from those which attack deeper seated parts, such as muscles, tendons, ligaments, &c. Burns, occasioned by boiling water, or by any other liquid, are not like those produced by the contact of any heated metallic body, or by the inflammation of any combustible substance. Burns, which do not destroy the epidermis, and only irritate the skin, are very similar in their effects to cantharides and other rubefacients. The irritation they excite increases the action of the exhalent vessels of the affected part, and the fluid which this furnishes, detaches and raises up the epidermis, from whence arise the vesicles, or blisters, more or less numerous, or more or less extended, according to the manner the offending cause acted. But if the skin and adjacent parts are destroyed, no blisters will appear; then a black and gangrenous eschar is seen, and after the eschar is thrown off, there remains an ulcer, more or less deep, according to the degree of heat by which it was produced."

"The pain caused by a burn is always very great, but in general greater when the skin has only been irritated upon its surface, than when it has suffered such a degree of heat as is capable of entirely destroying its organization. Sometimes we see a violent gangrene shews itself, and spreads to an alarming degree, in the cases where



the burn occupies a considerable surface, and this very soon after the accident has happened ; but, in general, the symptom most to be dreaded in such a case, is the inflammation. The pain and the irritation sometimes arise to such a pitch, in spite of all that can be done, that it is with difficulty the inflammation is prevented from going to the highest degree. And, when the surface affected is of considerable extent, the effects of this inflammation are not confined to the parts which were first hurt, but they frequently extend to the system, and cause fever ; nay, in certain cases, such a tumefaction is produced in the part, as may terminate in death."

"The first thing to be done when we want to relieve a burn of any kind, is to attempt to ease the pain by every possible means. When the structure of the skin is not destroyed, but only irritated, we are enabled to moderate, and in some cases greatly to allay the pain, by applications of a very different nature, and even directly opposite ; as for example ; we produce this effect by plunging the part burned, if practicable, into cold water, which is kept in that state by renewing the cold water, and retaining the part there ; or, if we cannot conveniently put the part into cold water, the keeping it constantly wet with sponges dipped in cold water, or compresses, repeated as often as they lose their coldness. This method, which we have always at hand, and which is not in sufficiently general use, is the best we can have recourse to in the first moments, and that which will, in the surest manner, prevent inflammation, if its use is continued a sufficient length of time ; it ought at least to be continued for several hours. What will appear very singular, and which we

shall not undertake to explain, is, that the same effect is obtained by rapidly plunging the part into boiling water ; a remedy which we shall not, however, recommend, and the use of which is certainly very precarious. Emollient applications are frequently used, and sometimes with sufficient success ; but in general they do not succeed the best. Those which are of an astringent nature, produce the most marked effect. It is with this view that brandy, and even spirit of wine, applied to a burn, relieves the pain, though at the first instant, it renders it more acute. For obtaining all the possible advantages from these strong liquors, it is necessary either to keep it plunged in, or continually moistened with compresses, wet with the spirit. Goulard's Water is also advantageously used for the same purpose, or a solution of sugar of lead. Also other astringent applications, as ink, or a strong solution of alum."

" It is in general thought that these remedies act by preventing the formation of vesicles, or blisters, which superficial burns commonly give rise to,—although it does not appear that this idea is well founded. For astringent and spirituous applications ease the pain more immediately when the epidermis has been detached from the skin, than when they are immediately employed after the accident took place, and before the blisters have sufficient time to be formed. Whatever means we employ, we should continue their use as long as there is a continuance of pain ; and in cases of very extensive burns, attended with much irritation, it would be well, independently of external applications, to give some doses of opium, proportioned to the acuteness of the pain. It is this medicine, amongst all those we can employ, that will suc-



ceed the best, in preventing that stupor which people, who have met with such accidents, frequently fall into,—a symptom which appears to depend entirely on the violence of the irritation caused by the action of the heat. The bark is likewise employed, with much success, to combat this symptom,—and, above all, in those cases where the wound carries any appearance of gangrene. When the epidermis is raised in the form of blisters, there are some who advise that they should be opened; whilst, on the other hand, there are who say they ought not to be touched. It is certain, that in opening them, the pain is sometimes much increased; but more particularly so when they are opened too soon, and before the state of irritation, caused by the burn, has ceased. The least admission of air to the surface of the skin, deprived of its epidermis, is, at this stage, extremely painful; but when the irritation is over, the blisters may be opened without fear, to allow the escape of the serum they contained; it ought to be done then, lest the serum remaining too long upon the surface of the skin, should produce a degree of ulceration, as sometimes happens when it is not absorbed sufficiently quick by the lymphatic vessels. But it is better, even at this period, to open them by simply pricking them, than by large incisions,—by which means the air will have the least possible access. After the serum is evacuated, the best topical application to the part, is a liniment, made with oil, wax, and a little sugar of lead. Oil alone has not a sufficient consistence, and runs off too quickly; and ointments which are stiffer, are more uneasy than a liniment, because they neither apply so well, nor are they taken off with

so much ease. By this mode of treatment, all burns, of which we have been speaking, will be easily cured; that is to say, those that are superficial, unless they are of a great extent: for in such case they sometimes excite a violent inflammation, and much fever; and then it is necessary to have recourse to *bleeding, and such other means as the particular symptoms that may happen shall indicate*. And, when a disposition to ulcerate is observed in the part, such remedies are to be used as the nature of the ulcer seems to require."

"In cases of burns, where, from the beginning, a loss of substance has taken place, (as happens when it has been caused by the application of a metallic body, heated to a certain point,) that which succeeds the best in easing the pain, after the application of cold water, sufficiently long applied, is the use of soft and cooling emollients. A liniment, composed of equal parts of lime water, and olive or linseed oil, with which the affected parts are kept constantly moist, by means of a soft brush, gives, in general, marked and often immediate relief. The patient suffers much by the application of any sort of bandage, an inconvenience which will be avoided by the means we recommend. But as soon as the pain and irritation occasioned by the burn ceases, the part affected must be covered, and treated in the same manner as if it had been an ulcer arising from any other cause. The liniment of lime water and oil which is mentioned, is one of those which gives the greatest ease. Nevertheless, sometimes we succeed as well, and even better, by the help of Goulard's Cerate, or other analagous topical means."



“ In cases of burns by the explosion of gun-powder, there is often a greater or less number of the grains of the powder lodged in the texture of the skin ; these grains greatly increase the irritation, and if they are not taken away, they commonly leave marks which are never eradicated. It is therefore necessary to take them away with the point of a needle as soon as possible after the accident ; and, with a view to diminish the inflammation, as well as to dissolve and draw away the particles of powder, which might still remain, it may be as well, for one or two days, to cover the affected parts with an emollient cataplasm. In other respects, these sorts of burns ought to be treated as the others.”

“ When the burn affects two contiguous parts, they are liable to form adhesions together, if precautions are not taken to prevent them ; this most commonly happens to the fingers and toes ; also to the nostrils and eyelids. The surest way to prevent these adhesions, is to keep the parts separated with pledgets, retained in their situation by any convenient bandage. It will be well to observe in this place, that in the treatment of ulcers, occasioned by burns, we often observe the flesh to take a soft consistence, to become fungous, and to rise above its natural level. When they put on this appearance, we must abandon emollient topical applications, and substitute in their place those which are rather of an astringent nature, and gently compress the part by means of a bandage ; the surface of the ulcer should be bathed with Goulard's water, lime water, or a solution of alum, and it should be dressed with an ointment of prepared tutty. These means will, in general, be sufficient to

repress the growth of fungous flesh ; but should it still continue to arise, we may apply some burnt alum, vitriol, or *lapis infernalis*, to destroy it."

This article, from the French *Encyclopedie*, shews us, that the knowledge to be obtained on this subject from our continental neighbours, is nearly similar to that of our own. In many parts there is so striking a resemblance, that I should suppose the French account merely a version of Mr. Bell's System. In addition to the variety of means recommended by the ancients, these gentlemen come forward as the advocates for the application of cold water ; but they also tell us, that to plunge the part into hot water, gives immediate relief. We therefore see there is still the same want of principle in the external means. Internally, the antiphlogistic system is as strongly recommended as by the ancients.

I shall now proceed with the inquiry respecting the opinions of the moderns. In a work edited by Mr. Fourcroy, at the beginning of the French Revolution, (1791,) entitled *La Medecine Eclairée par Les Sciences Physiques*, there is a Memoir upon the Treatment of Burns, which I shall now present to the Reader.

"The most ordinary diseases, and the most common accidents, are the worst treated ; as blind empiricism has multiplied the means of cure. A burn is a striking example of this. There is no accident for which we have a greater number of remedies, and at the same time there is none where the curative power is less ascertained. Each family has its receipt, and each empiric his ointment. To such a degree of absurdity is this carried, that with reason, the term *nostrum* is



meant to denote any useful or dangerous secret."

"This multiplicity of means to cure burns proves that none of them have the power, and that nature must do her own work. Fortunate would it be if none of these pretended means retarded the operations of nature. It will be impossible to entertain any other idea of such ridiculous and absurd mixtures, when we look at their composition; but, more particularly, when it is known that they are recommended in every species, as well as in every stage of the disorder."

"If some authors have given rules concerning the treatment of burns, they differ so much from each other, as glaringly to shew the necessity of submitting the subject to new discussion. In this point of view, select facts should be collected and compared, and none but just inductions drawn. It is not enough to divide the remedies into heating and cooling, moistening and drying, tonic and relaxing; nor burns themselves into superficial, as those of the skin, and others of the deeper seated parts; or to consider the general difference of the burning matters; but we must even yet follow the road pointed out by FABRICIUS HILDANUS, (who is the author that has best treated this part of our art) and apply the most convenient treatment to each species of burn, and to particular circumstances as they arise. But, above all, we ought to study the prognostics; and to know that if, in general, deep and extensive burns are troublesome, yet those of the skin are often more dangerous, from the violence of the pain, the profuse suppurations, and the quick manner in which they weaken and exhaust the patient. A treatment without rule exposes us to the same danger."

“ The ancients thought that, in order to cure burns, it was only necessary to extract the *empyreuma* from the burnt part. They attempted also to draw out the *fixed* fire from the part. FERNELIUS regards fire as the true remedy for the evils it produces. FABRICIUS HILDANUS advises the immersion of the part into water as hot as can be endured. FALLOPIUS recommends this also, as one of the best means. Dry heat, according to all these authors, has the property of preventing the formation of vesicles, or blisters. VAN SWIETEN, in discussing at length this subject, as also HEISTER, and AMBROISE PAREY, all recommend the same remedy, and support their opinion by their own experience; but all agree that it is only useful in superficial burns, and at the moment of receiving the accident.”

“ It is with the same intention that alcohol, and all remedies which are denominated spirituous, are recommended. SYDENHAM advises alcohol in recent burns; not only, as VAN SWIETEN supposes, to resolve inflammation, but to prevent it. VAN SWIETEN would have spirits of wine instantly applied, to prevent suppuration and dissolution. If used later, it might be dangerous, and give rise to more distressing symptoms. VAN SWIETEN does not advise the use of alcohol in deeply-seated burns, caused by gunpowder, boiling oils, rosin, or other very hot bodies, for fear of hardening the eschars. Notwithstanding, it is a fact, that the drier the eschars, the more easily are they detached from the living fibres. The emollients, and softening relaxing ointments, recommended by VAN SWIETEN, frequently retard suppuration, and give rise to a foul putrid



ulcer, the more to be feared, as it is what we ought particularly to guard against in burns."

"In observing what passes in burns made by art, such as the actual cautery, or by means of moxa, we may form some just idea of what happens in accidents of this kind. We know that the falling off of a dry eschar is retarded by the application of unctuous bodies ; that if it is not divided, it does not fall off until some weeks ; that a slow inflammation is excited around the edges, which is opposed by relaxing and softening means ; but, on the contrary, by drying it with the use of spirits of wine, dividing it, and then putting the lint into the scarifications, impregnated with the Egyptian ointment, the cellular membrane below is hardened ; suppuration takes place in a few days, and the falling off of the eschars shows that the healthy fibres below are disposed to cicatrise ; whilst those which appear after the falling off of an eschar, treated by relaxing means, are soft and fungous. We may therefore conclude that the common method of treating eschars from burns, by oily, unctuous, and relaxing means, is highly pernicious."

"VAN SWIETEN, by throwing aside the use of spirits of wine, and recommending the use of relaxing methods, has certainly been guilty of a great error. In vain he brings forward an observation of LA MOTTE, which we will relate : This surgeon was called to the assistance of a young girl, who fell on her face into the fire, in an hysteric fit, and in attempting to disengage herself, slipt backwards, so that she was burnt in the face and neck to the breasts, and behind, from the nape of the neck to the shoulders.

Rags, moistened with spirit of wine, were applied immediately, and continued for three days; but the pain increased, and the blackness, which was apparent on the first day, spread on all sides, accompanied by an insupportable cadaverous stench. The face was more slightly burnt than the rest; but from the chin to the breasts, and from the nape to the lower part of the scapulæ, there was only one gangrenous and dry crust. Deep scarifications were made; the Egyptian ointment, dissolved in spirit of wine, was applied; and the whole covered with compresses, moistened in the same liquor. Nevertheless, all the parts became very dry; and as no appearance of supuration ensued, these means were desisted from. The parts were then dressed with a soft cerate, composed of yellow wax, olive oil, and the yolks of eggs roasted under the fire. Three days after the use of this cerate, the parts became moist, and the dead eschars began to fall pretty quickly, so that, in the space of a month, the whole was tolerably clean. It was four months before this patient was cured.

“VAN SWIETEN draws the same conclusion as LA MOTTE, who, after this and some similar facts, declaims much against the use of spirit of wine; and pretends that his softening ointment is able to obviate every untoward symptom that may arise in the treatment of burns. It is very evident, that the alcohol, used in the first instance, dried the eschars, which, had it not been applied, would have followed that tendency to gangrene which takes place in all burns, and would undoubtedly have destroyed the subject. LA MOTTE is mistaken in regard to the pretended inconvenience of this remedy, as well as



in the pretended power which he ascribes to his ointment, of causing the suppuration. The very case itself proves the drying power of alcohol. It is equally true, that alcohol, though extremely useful in the first instance, may prove highly pernicious when a great inflammation has succeeded the first effects of the burn.

“Repellants have been much boasted of; we are told they throw back the blood and humours which are carried to the burnt part, and that they resist the formation of blisters. Ink is the most common of these remedies; and if its success be the greatest in the most trifling cases, yet there are examples of its utility in very serious ones. DIEMERBROECK gives instances of this in his works. A man, wishing to extinguish a kettle of melted rosin, which had caught fire, he took a pillow, and in his hurry plunged his arm into the inflamed matter; the pain was in consequence extremely severe. DIEMERBROECK ordered a servant to bring a large stone bottle of ink, which he had just made, and pour it into a large vessel, into which he made the man plunge his arms, and keep them there for half an hour, at which time the heat and pain were dissipated; nor were there any blisters formed: so that this burn had no other ill consequences. In case ink in a sufficient quantity should not be at hand, street mud may be used as a substitute. PANAROLE, an Italian physician, recommends, if mud cannot be found, to make it artificially, by mixing water with street dust, or the sweepings of houses. Onions have been much vaunted. FALLOPIUS says he has tried them successfully upon himself. FERNELIUS speaks of the powers of a poultice, made with peeled onions and salt;

but AMBROISE PAREY remarks, that it should only be used when the skin is not destroyed, and that it prevents blisters. FABRICIUS HILDANUS adds to the onions white Venice soap, oil of sweet almonds, and oil of roses, so as to form a mass, of the consistence of an ointment. He quotes many cases, in which his application was of use ; particularly adducing that of his wife, who had burnt herself by imprudently plunging her hands into some wine, which she was using in her cookery."

"It is difficult to account, amongst so many different and boasted remedies, and the many attested proofs we have of their efficacy, why authors have never mentioned the application of cold liquors. Instinct, which suggests to a burnt person the application of cold, the most natural of all remedies, we might suppose would have induced surgeons to make trial of its efficacy. The following observations will shew us, that the mere renewal of cold water is one of the most precious means we are acquainted with."

*Observations on a Burn, by Mr. EMASLE, in the year 1774.*

"A servant girl, taking a large pot from the fire, spilt a portion of the hot broth upon her fore arm. EMASLE happening to pass through the kitchen at the same time, he immediately directed her to expose it to a stream of cold water, which was conveyed to the kitchen by a cock ; he was soon determined in his choice, as it was the readiest application that he could find at the moment. The girl had sufficient perseverance to submit to this application for more than an



hour ; her arm was then covered with flour, a remedy recommended to her by one of her fellow-servants. On the evening of the same day, she walked about without suffering any pain. On the following day, when the arm was cleaned, it appeared in a healthy state ; some days afterwards the cuticle peeled off. This observation may have its use. It shews the success of cold water in burns ; and seems to lessen the opinion of VAN SWIETEN, who says, that all lotions, or topical applications, used cold, produce a pernicious effect in burns. This assertion appears to have been advanced in too decisive a manner, as it may set aside an efficacious remedy. The commentator ought to have divided the different stages of burns, and to have brought into one point of view what was indicated in each ; in making these distinctions, he might have developed the essence of burns, and appreciated the true value of the action of cold. If it should be proved, from observation, that this action is dangerous, when a part is much inflamed and engorged, perhaps other cases may be found wherein it would be successful, as in the instance of certain species of burns happening. In reality, does not cold class with repellants ? and why may it not be conveniently employed to throw back the flux of humours from the part, and to prevent or moderate the engorgement ? Do not we see, every day, that in sprains, when the foot is put into cold water, the action of cold produces the most salutary effects, provided the part is immersed in the instant ? Thus it is with burns ; allow the first moments to be neglected, and the regular practice will not then allow such proceedings. When the tissue of the skin is

burnt, and relief has not been given in the first moments of the burn, the blisters are cut, and are dressed with some cooling ointment, as populeum cerate, linseed oil, with lime water, or nutritum ; although several facts prove that these greasy applications aggravate the disorder.

“ The example of BOERHAAVE, who treated himself for a very severe burn of the face, from the vapour arising from the bursting of Papin’s digester, does not increase our hopes, as, from the application of nutritum, he had a long and tedious suppuration. The same consequences are frequently observed in military hospitals, in the cases of burns produced by explosions of gunpowder in the parks of artillery. The ointments which are used, frequently produce tedious suppurations, and leave the fibres in a state of softness and inertion, which prevents cicatrization, and exhausts the patients.

“ FABRICIUS HILDANUS was astonished to find more than half a pint of pus upon the leg of his servant, who had scalded herself with boiling water ; she was dressed twice a day. The same fact takes place in blisters. and may be observed every day. All greasy and relaxing applications inevitably produce this effect ; therefore, the cure must always be completed by absorbents. Lime-water, and the oxide of lead, are the principal. We see that the eschars produced by burns, ought always to be *scarified*, to prevent too abundant collections of matter, which take place underneath them. *We should not spare these scarifications,—they ought rather to be increased*, in order to bring the injury to the state of a simple wound. The incisions ought to cross, so as to present several angles. It was for



the want of such a proper treatment as this, that King Stanislaus fell a victim to his burn. By great attention in the dressings, and a scrupulous exactness, we frequently obtain a cure in burns of the most severe and desperate kinds."

This case, as related by Mr. EMASLE, requires considerable attention from me, as it recommends a remedy which my practice condemns. I shall not deny the benefit of the application of cold water in this case; but I must deny that the morbid action occasioned by heat, had taken place. The epidermis, which is provided by nature, to prevent the too immediate effects of sudden impressions upon the nerves of the skin, will guard the fingers from the effects of red hot iron, when the hand is rapidly struck against that substance. This is a familiar experiment, which every school-boy must have seen. If, therefore, a hot fluid be applied to the surface of the body, and it be immediately succeeded by cold water, before it has imparted its heat to the body, or excited a morbid action in the part to which it has been applied, then it will be clear that the cold water has prevented the disorder. But prevention is not cure, though in many cases it may be better. Nor do I mean by this to deny, that the morbid action, excited by heat, has not been cured by the continued use of cold, as well as by many of the absurd remedies we have seen recommended.

The means adopted by a by-stander, to extinguish the flames of a person having his cloaths on fire, and to prevent the pernicious effects arising from the burning materials, would be very different from those which would be resorted to by a medical man, called upon to cure

the effects of the fire upon the body. In the one instance, to throw buckets of water, in order to extinguish the flames, would be highly rational; whilst, in the other case, for the surgeon to continue such practice afterwards, would be highly irrational. This is not the place to explain the seeming contradiction. I shall therefore proceed with the Memoir from *La Medicine Eclairée* :—

“ *Observations on a severe Burn of both Legs,*  
by Mr. DIDIER the elder.

“ In the month of September, 1773, a person taking from the fire a mixture of oil and turpentine, it inflamed, and fell to the ground, when a young man, a student in pharmacy, wishing to assist in extinguishing the flames, received a great portion of this matter upon his legs; his cloaths immediately took fire, when, with great presence of mind, he ran and threw himself into a large vessel, where he made them throw several pails of water upon him to extinguish the flames. While in this situation, he had no other desire than to remain immersed in the water, and wished to increase its efficacy by adding ice; but being obliged to desist by the advice of his friends, he left his situation, and placed his legs in a bath of spirit of wine, where he remained an hour.

“ Coming in at this period, I found, on examination, that the burn extended from the knee to the ancle of each leg. The epidermis was totally destroyed, and exposed the skin to view, of a dirty white colour, hard, dry, and stretched. The first indication which struck me as necessary, appeared to be a salutary relaxation of the parts;



to procure which, I covered them with lawn paper, spread with recent populeum, (an emollient ointment, made with wax, palm oil, &c.) To prevent any accident arising in consequence of inflammation, and to abate the violent agitation in which my patient was, I bled him twice the same day; in spite of which he became very feverish, and was delirious during the night. The following day, when the dressings were taken off, at a consultation, we found the whole of the skin black, dry, and struck with a gangrene.

“ Not entertaining any hope of preserving the skin, with a view of accelerating its being thrown off, and preventing the evil consequences of a deeply seated suppuration, which would necessarily take place internally, we thought proper to make scarifications, and even incisions. The dressings were afterwards applied, according to art; and in the space of a fortnight, the eschars began to fall, and exposed the muscles of the legs the whole extent of the burn. In this state, I substituted, instead of the first dressings, (which, I suppose, were the Egyptian ointment, with spirit, or wine) equal parts of cerate and populeum, large and soft pledgets of which were applied. The suppuration was, for a long time, very abundant; to moderate which, greasy applications were desisted from, (the use of which is indicated only in the first moments) and recourse was had to wine, with honey, and in the end, dry lint. Cicatrization began pretty quickly around the edges, and was encouraged by applying pieces of cloth, dipped in the Nuremberg plaster. Small points of cicatrization were imperceptibly formed in different parts of the wound, and made, as it were, so many little

islands, which, having been joined with each other, blended themselves with the circumference, so as to form a greater number of curative edges, which appeared to multiply the powers of nature.

“ The parts of the wounds which were over the gastrocnemii muscles, resisted, for a long time, every means that could be used for them. Nature appeared fatigued with her exertions, and the cicatrices remained for some time stationary; even those which carried the appearance of being well formed and strong, began to give way here and there. These circumstances were frequently attributed to the irregularity of the patient, but they more essentially depended upon the very rudiments of the skin being destroyed. The muscles being laid bare, the process of skinning was with difficulty carried on upon the muscular fibres, which offered no good base for its formation. Continually exposed to the involuntary contractions of the muscles, the tender newly formed skin was frequently torn and destroyed; and often, at the end of a week’s dressing, the wound was more considerable than before. It was with the greatest difficulty that the last point of cicatrization was accomplished.

“ With this view, I have been induced to point out the difficulty, and to shew the inefficacy of the variety of means recommended by interested people, as a radical cure of such a serious accident. Besides these means, many astringent lotions are recommended; such as a decoction of aristolochia, plantain-water, with prepared tutty, a decoction of Peruvian bark in wine, with many *et cæteras*. That which succeeded best with me, was a solution of lapis-infernalis, and dry lint. Yet, by employing all these means, it required



full *eighteen months* to cure the right leg, and *more* for the cure of the left. After some time, the right leg acquired strength and motion, so that the patient was enabled to move about with the assistance of crutches, hoping that the left leg would in time recover its powers.

“The severity of the accident, and the oppressive position the patient was obliged to keep, made him fear he should lose the use of his legs. I always kept up his spirits by assuring him of the contrary, and I have not been disappointed; time, with proper and repeated flexions, partial warm baths, and rubbing the part with a pomatum, restored to the muscular parts their softness, and to the joints their motion.”

The above case, as related by Mr. DIDIER, was certainly a very severe one. It required infinite care, and consumed a great deal of time, during its tedious treatment. The circumstances of the case are related with much candour. In commenting on the treatment, I trust I shall not be accused of wantonly finding fault, should I assert, that the symptoms were aggravated rather than relieved by the means used. As I shall afterwards comment on my own errors with the same freedom, I hope this will be a sufficient apology. There can be no better mode of advancing our own knowledge, than by benefitting from our mistakes; and if another has given us a faithful account, ought we not equally to benefit from his? Every medical observation, when made known, belongs to the whole Faculty, as common property; every one may use it, only observing the golden rule, to treat it with the same candour he would wish his own to be treated.

The empirical mode of applying cold water, to extinguish the flames, I shall not condemn, though I objected to it in my former edition of this work. It can hardly be regarded as a part of the treatment; it was resorted to in order to prevent the injury, but not to remedy the effects. The next application was spirit of wine; but this was not applied in the best manner, as I shall afterwards point out.

When Mr. DIDIER saw the patient, he began to treat the case systematically; externally he applied emollients; and, to prevent inflammation, ordered *two* bleedings on the same day. At a consultation on the following day, because the skin was injured and dry, he scarified, and made incisions through it. Horrible practice! As if the fire had not destroyed enough, they must destroy more by the knife. The idea of a deeply seated suppuration under the skin was visionary, and led to a cruel mode of relief. Superficial eschars never form deeply seated suppurations. The healthy parts around them inflame and thicken, when absorption takes place, and the dead part is detached from the living. The process of detaching eschars depends upon the energy of the system; therefore, whatever weakens the constitution during this process, impedes nature in her salutary operations. Thus, bleeding, purging, and the antiphlogistic regimen, at this period, is highly pernicious, and frequently attended with fatal consequences. The facts which I can adduce to prove this, I trust, will be as convincing to others, as they are to me. I shall now proceed with the Memoir.



“ *Observations upon an extensive Burn, by Mr. REYNE, Surgeon, at Vaucouleurs.*

“ On the 27th of October, 1774, a young woman was brought to the Hospital of *La Charité*, in a paroxysm of epilepsy; she had fallen into the fire, and was alone at the time of the accident. Having been sent for to give her assistance, I found her in a truly deplorable state, suffering the most excruciating torments. The superior extremity on the left side, from the upper and middle part of the humerus, to the ends of the fingers, presented only one scorched and tense surface, having no appearance of blisters. The accident was most severe at the inferior part of the extremity; and still more severe on the anterior and inferior, than on the posterior and superior. The wrist and fingers were of a black colour. These parts were all considerably diminished in size, and the two last phalanges were so contracted, as to lose the power of extension. The motion even of the lower with the upper arm could not be executed without violent pain. The left breast, as well as the anterior part of the thigh, and the leg of the same side, were pretty deeply burnt.

“ The right side, though less exposed than the left to the action of the fire, did not escape its effects. The burn did not extend quite so high upon this arm as on the other; the fore arm, the wrist, and the fingers, were spared in different parts anteriorly. Blisters were formed in various parts of the breast, abdomen, and thigh, of the right side.

“ At the very sight of such a terrible accident, the first impulse was to abate the pain. I opened the blisters, to discharge the extravasated

serum; and made an ointment with linseed oil, virgin wax, and calamine stone. All the parts that had been exposed to the action of the fire, were covered with plasters, spread with this ointment, upon lawn paper. The patient was *twice blooded*, that night, and *once* the following morning. On taking off the dressings, which was done at the end of twenty-four hours, little change had taken place; the plasters remained equally moist, except in those places where the blisters had formed, and the pain continued undiminished. These dressings were persevered in for three days, when the burnt parts began to exhale a thick fetid vapour. The wrists and fingers of the left hand were the only parts which did not give this sign of volatility; this made me fear that the vital action of the part was destroyed.

“The great extent of the wounds, and the frequency of the dressings, which I foresaw must be the consequence, when suppuration was established, induced me, from motives of economy, to make use of an ointment which I had frequently ordered to poor people, and which I had seen used with success. LEMERY praises it very much; and says, there is no application of such general use, in *every species of burns, and in all their stages*. It is made with two parts of hogslard, and one of fresh horse-dung, fricasseed together for some time, over a slow fire, and then strained. Two days after the use of this, the skin became much softer, and rose in those parts where the burn was most superficial. The wrist and fingers of the left hand also gave the same marks of life, which, as I have before mentioned, were shewn by the others. As soon



as the suppuration was established, I cut off the eschars by degrees, when they became detached; so that the whole body of this poor girl was covered with deep ulcers.

“ The superior extremity of the left side having, as I have already remarked, suffered the most, it had the deepest ulcers. There were places where the bone was exposed, and the extensor tendons of the fingers were partly destroyed. Thus the flexors, having nothing to counteract their action, drew in the phalanges; notwithstanding which, as soon as the parts that covered them were a little softened, I was enabled to bring them into their proper position. The capsular ligaments were bare and open in some points, so that I despaired of saving them. To have taken them off, would have simplified the cure materially; but the desire of saving the poor girl such useful and necessary organs, induced me to make every attempt, in seconding the efforts of nature, for this purpose; and I had the satisfaction to find that my endeavours to this end were not fruitless.

“ After a month of this treatment, when the exposed fibres looked healthy, and the superficial ulcers were drying, the cure was retarded by an accident, the cause of which I could not divine. A general leucophlegmatic habit, with a tendency to ascites, suddenly shewed itself. The ulcers discharged a great quantity of serum; and the fibres, which before were red and healthy, became white, flabby, and fungous. I had my fears for the life of my patient; but by the use of the aperient remedies, generally resorted to in such cases, this disease disappeared almost as quickly as it came on. The ulcers did not easily recover their former healthy state; yet, in time,

and by proper treatment, I ventured to hope for a perfect cure. On the whole surface of the burnt parts there daily arose points of drying, (or skinning,) according to the depth of the wound; these points increased their circumference, and joined each other. Water, retiring from an unequal surface, after an inundation, will give a tolerable idea of the appearances which took place. At the end of ten weeks, the breast, the right arm, the abdomen, and the thighs, were cured; and there only remained the left breast, a part of the fore arm, the wrist, and the fingers, of the same side. These ulcers were of a much more obstinate tendency than the others; even yet they required three months more dressing. The breast was nearly destroyed by the great suppuration; the extensor tendons of the fingers, and the metacarpal bones, both exfoliated; and, notwithstanding all my care, the fore and middle fingers could not be preserved.

“ During the whole of this long cure, I always used the same ointment to the soft parts, and to the denuded bones; lint, dipped in tincture of myrrh and aloes. To prevent an anchylosis, the joints were made to perform their proper motions, and I retained them in a state of extension, to prevent the unpleasant consequences of forming the cicatrix in a state of flexion. In the beginning, the patient was put upon a *severe regimen*. I made her take *cooling ptisans* and *soothing potions*. She was discharged from the hospital in the month of April following, having been there six months; and she was afterwards enabled to gain her livelihood, by spinning cotton, with the fingers that remained. It is worthy of remark, that during two years and a half since



she has been cured, the fits of epilepsy have been less frequent, and of shorter duration, than before.”

This case, as related by Mr. REYNE, is more conformable to a principle than the former one; and though I may not perfectly accord with that principle, yet I like it in this state better than a mixed case, which is partly conducted on one plan, and partly on another. When different modes of treatment are thus fairly opposed to each other, the conclusions drawn from the result will be more valid. The external treatment, from the first, was of the emollient character. Although the eschars, in some parts, penetrated the tendons and bones, yet there was no *deeply seated suppuration*. The eschars were thrown off even by the weakened powers of this debilitated subject. This is a strong case, to shew the inutility of the barbarous practice, formerly resorted to, of scarifying and incising such eschars. The internal treatment was of the same character as is recommended by all authors, viz. two bleedings on the day of the accident, and one on the following day; a severe regimen, with cooling ptisans, and soothing potions. Thus we see the whole of the antiphlogistic regimen displayed in the treatment of the present case.

This Memoir, in the *Medicine Eclairée*, is drawn up with considerable ability, and places the total want of principle, as to the external mode of treatment, in a very strong point of view. A person ignorant of the treatment of such accidents, could not gain a precise knowledge from the perusal of the works I have quoted. He might as well write on slips of paper the different applications, roll them up, shake them in a bag,

and dip for his chance, as to expect to be guided by a well-formed judgment from the authors above mentioned.

In conversing with an ingenious friend, who had for some years been a surgeon in the navy, he informed me, that during the American war, when his ship was at Barbadoes, an explosion of some gunpowder took place, by which several of the crew were much burnt. They were immediately sent to the Naval Hospital at Bridgetown, where the only means made use of to relieve them, was to keep them constantly anointed with oil, which was done by means of a feather. They were thus treated for several days, lingering in their torments, and in the end expiring, worn out with pain and fever. I had the above observation from the late Mr. Horn, of Newcastle. Those who had the pleasure of knowing his open and manly character, will duly appreciate the truth of this, as well as of the other communications I shall have to make from the same quarter.

A Gentleman, who had received his medical education at Whitehaven, in Cumberland, where the coal-mines are very subject to this species of accident, informed me, that the application of oil externally, and the antiphlogistic regimen internally, form the general routine of practice in that neighbourhood.

I have made it my business to inquire, and have conversed with Gentlemen of the Faculty, who have practised in all quarters of the world, both in the Army and in the Navy,—and I have found the greater number in the habit of using emollient applications. Some few have deviated from this routine, by using what is termed the



Carron oil; others Goulard's water, and saturnine applications. A physician told me, that an old woman had acquired celebrity in the treatment of burns, who was accustomed to wash them with gin. Regular practitioners, and most of the hospitals in Europe, have sanctioned the use of emollient remedies. A few empirics have acquired note from a different plan; but all, when they speak of means to abate fever, and prevent inflammation, uniformly recommend the antiphlogistic regimen. This is a principle in which all agree. But as it is a principle in which I do not agree, it forms one of my chief motives for venturing to address the public on the subject. It is not, however, merely by my dissent that I shall expect to convince my brethren, of the fallacy of opinions, which the practice of ages has sanctioned, and which many of the most eminent and celebrated luminaries of our science have cherished and taught. On the contrary, I shall proceed to lay before them those facts upon which I ground my dissent, and to which, even had I not been the observer, and had they been equally well substantiated by another, I should have deemed it my duty to have granted my confidence.

Peculiar circumstances have given me an opportunity of observing many who have been destroyed by the effects of fire; these circumstances have also enabled me to appreciate the effects of different modes of treatment upon individuals; by which means I hope to point out the best method of placing such individuals under the most favourable circumstances for relief: so that the lives of many thus injured may be saved, who otherwise would fall a sacrifice to the injury. As such oppor-

tunities do not happen to many, when they do occur it becomes a sacred duty in the observer to note them, for the benefit both of his contemporaries and of his successors. Fully impressed with this obligation, I shall proceed to point out the result of different modes of treatment.

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### CHAPTER III.

**FIRST MODE OF TREATMENT.—PROGRESS OF MEDICINE MUCH RETARDED BY THE NARRATION OF CURES IN UNIMPORTANT CASES.**

—A RELATION OF CASES WHICH WOULD TERMINATE IN LIFE OR DEATH, ACCORDING TO VARIOUS OR DIFFERENT TREATMENTS, IS THE BEST MODE OF ASCERTAINING TRUTH.

—EXTERNAL EMOLLIENT APPLICATIONS UNIVERSAL IN THE NEIGHBOURHOOD OF NEWCASTLE-UPON-TYNE.—CASE OF JOHN THOMPSON, WHICH TERMINATED FATALLY ON THE NINTH DAY.

**F**ROM the very great variety of applications, so strongly recommended by the most eminent medical characters, in the preceding chapter, an inexperienced practitioner would be at a loss on which to determine; and were we to add the miraculous cures performed by the nostrums of every village doctress, we should only add to his embarrassment. I apprehend one of the greatest



causes of delusion arises from attributing to various applications the power of curing *slight* burns, many of which would have been cured without any application at all, and some perhaps much sooner than by the applications which were used. This mistake frequently arises from the most benevolent motives, by the kindest intentioned people : for if we have seen a person recover from any complaint, during the use of any particular means, we naturally imagine such beneficial effect to have arisen from that cause ; although further experience may prove to us that such an effect could not have been produced by the cause we assigned. Nay, experience may still go further, and convince us that what we regarded as curative means, was actually pernicious. This is the fruitful source of error, and the basis of all charlatanry. The sanguine and the credulous have always such facts to bring forward in support of their favourite remedies ; and then they triumphantly assert, “ there is no arguing against matter of fact.” But what do their facts amount to ? Nothing more than this, that in some cases the vital power is so strong, and the injury so small, that with all the interference of officious ignorance, it cannot be destroyed. All quack medicines are supported by such facts as these, and they are made to suit all characters, and all ranks of society. And thus every body sets himself up as capable of appreciating the powers of unknown compositions.

In a commercial country like this, it is surprising that the interest of the faculty should not be defended against such a *contraband trade* as that of quack medicines. Who would conceive

that, in this enlightened country, a gingerbread baker (Godbold,) should acquire a princely fortune by the sale of a pretended secret remedy ; whilst some of the greatest men, even professors and teachers of the science, have pined in penury and want ? Either the faculty are capable of taking care of the general health, or they are not. If they are, as they are a numerous and necessary body in the state, surely their rights and privileges should be attended to with the same candour and vigilance as those of any other class. This is the point of view in which the legislature should regard any measure brought forward to benefit or regulate the interests of the profession.

Having pointed out the source of error in forming an estimate of the value of different modes of treatment, I shall endeavour to avoid the delusion, by only bringing into comparison very severe cases, such as would terminate in the destruction or safety of the subject, according to the different modes of treatment. By thus contrasting different modes of treatment, I hope to be enabled to point out some of the laws which govern the system, when assailed by the destructive influence of fire. As nature is unalterable in her rules of action, if they can be once ascertained, they may safely be relied upon. Gravity existed the same from the creation to the time of Sir Isaac Newton, and remains the same still. He defined its laws ; he was the privileged mortal who interpreted them to his fellows ; but we are all obliged to be obedient to them when we have to act upon dead matter. As subjects of nature, we must all be obedient to her decrees ; happy are they who best know and obey them. Thus, it is a



general law of nature for fire to destroy the organization of animated beings. If, therefore, such a being places himself, or is placed, in contact with fire, he is immediately acted upon by it, according to the degree of exposure. Throw an animal into a furnace of melted glass, and he will be calcined in a few moments. In this intense degree the effects of fire so perfectly destroy the organization, that no human means can restore it. Infinite are the shades of injury between this destructive degree, and that which merely excites a slight morbid action of the part affected; as for instance, a drop of sealing-wax upon the finger: yet the agent which inflicts the injury is the same in both instances, namely, caloric, or heat; but its intensity varies.—The treatment which would draw the individual back to perfect health who had advanced the farthest on this scale of destruction, must undoubtedly be the best. I shall therefore commence the narration of the different modes of treatment I have pursued; and first with that which I began with. It was practised at the county hospital of Newcastle-upon-Tyne, where I was then studying.

Immediately after the explosion of a mine, the surgeon was sent for; the messenger was informed of the number of men injured, and, as well as it could be ascertained, the degree of injury they had severally sustained. According to this report, he was furnished with a proportionate quantity of common green oil (from rape seed,) with *ceratum flavum*, to which a more than ordinary proportion of oil was added, to facilitate its being spread upon lawn paper. When the

surgeon arrived, and had examined his patient, if he found any vesicles (or, as they term them, *blushes*) had arisen, he was immediately to snip them with the points of his scissars, to let out the extravasated lymph ; on the dexterous performance of this part of his business, in a great measure, depended his reputation, as well with the patient as with the gossips in attendance. In some cases this was a troublesome task, for fresh vesicles frequently arise during the time of dressing, and are pointed out as *blushes* which had been neglected. When this operation of opening the vesicles was finished, the patient was anointed with the oils, by means of feathers, made into a species of brush ; the ointment was then spread pretty thick upon sheets of lawn paper, which was cut into such forms as would most conveniently apply to the different parts of the body that had sustained injury. If the extremities were implicated in the accident, bandages were applied to keep on the dressings. When the dressing was completed, the patient was put to bed ; if the plasters became dry, or he complained of severe paroxysms of pain, the attendants were ordered to raise up the plasters, and to anoint the painful parts with fresh oil. To these directions due attention was paid. I have known, in extensive burns, where the paroxysms of pain were frequent and severe, that more than a gallon of oil had been applied in the course of twenty-four hours, to one individual.

When these accidents happened in summer, such quantities of oil thrown upon the bed and linen, aided by the heat of the weather in making it rancid, gave rise, in a few days, to the most



offensive effluvia, contaminating the air of the house. This nuisance alone was a dreadful trial, both for the patient and his attendants. Such mode was pursued, until what they termed “the fire was killed,” when the oil was desisted from, and the ointment alone applied. The phrase, *killing the fire*, means the period when the pain ceases, and the suppurative process begins to take place; it seldom commences until the third or fourth day, and the more severe the burn, the later does this salutary process begin. If it had not taken place by the eighth day, the patient was generally exhausted by the symptomatic fever; the injured parts lost their colour, the tumefaction suddenly fell, and spots of various hues took place on the burnt surface, from ash-coloured to dark and livid, approaching to black; the face shrunk, the pulse became tremulous, and hiccup announced the approach of death, which happened, in many cases that I have seen, upon the eighth day, or the succeeding night.

Such was the uniform progress of these accidents, when treated as above described, externally. Internally, the mode of treatment was perfectly consistent with the external means. What was termed the antiphlogistic plan, which VAN SWIETEN asserts should be strictly attended to in all cases of burns, was duly observed. Under the idea of the fire having entered into the cavity of the thorax, (which, from the immersion of the person in disengaged heat for some minutes, might be the case) large quantities of oily emulsions were given, during the first days of the accident; and an opiate at night. If the fever ran high, cooling purges, with nitre

powders, and decoctum antiemeticum,\* or some cooling febrifuge drinks. This was the general course pursued until the suppuration took place. In fatal cases, where there was no suppuration, a day or two previously to dissolution a cordial julep was ordered, at which time, exhausted by fever, and a mortification of the burnt parts having taken place, the patient was past the reach of medical aid.

In those cases where recovery followed the above plan, the secretion of pus was extremely abundant, and it was very difficult to prevent the surface acquiring a loose, glassy, fungous appearance, which required the use of astringents, such as an infusion of roses, to wash the parts with; and, if very luxuriant, strong vitriol water, or the solution of some caustic substance. The consequences of such treatment were, very unseemly and tender cicatrices. With a view of supporting the patient's strength, as soon as the suppurative fever had ceased a nourishing diet was permitted; the peruvian bark was administered, and port wine or strong beer were allowed, according to the circumstances of the individual. As the pain ceased on the appearance of suppuration, the appetite increased; this they indulged to the utmost, supposing they were aiding the intentions of the medical attendant, by keeping up their strength, and supporting themselves under the great discharge of pus. From the fever and irritation kept up in the system by the above

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\* DECOCTUM ANTIEMETICUM.

RECIPE.—*Kali præparati drachmas ij; Aquæ bullientis libras iij. Acidi Vitriolici, q. s. ad saturationem. Aquæ Menthæ sativæ, Syrupi simplicis, aa. uncias ij misce.*



treatment, I have frequently known the discharge so profuse and long continued, that the sores have become of necessity drains to the system, and been as difficult to cure as old ulcers.

I have now given a very concise and general view of the manner of treatment marked out for me to pursue in such accidents. To detail one case, which terminated unfavourably, will therefore be sufficient : for although I have seen many more having the same termination, yet, as the symptoms in all were so similar, a description of one may be regarded as a history of the whole.

### CASE.

JOHN THOMPSON, aged 56, a workman in a coal-mine in the neighbourhood of Newcastle-upon-Tyne, in the year 1786, was exposed to the contact of disengaged flame, from a collection of inflammable air (hydrogen gas.) The working dress he had on at the time, consisted of a flannel waistcoat without sleeves, and a pair of flannel drawers ; these preserved the parts of the body which they covered from the effects of the fire. When viewed, thus equipped, the parts which were exposed to the action of the flame, were his face, neck, breast, arms and hands, legs and feet. Upon examining him, I found several vesicles formed on his legs and feet. These were opened with the points of a pair of sharp scissars ; and then he was anointed with oil ; and plasters, of yellow wax and oil, spread upon lawn paper, were next applied. He was afterwards placed in bed. Upon inquiring of him how he felt after his burn in the mine, he said he was in great pain, and that as soon as the fire ceased, he was

siezed with as violent a *shivering fit* as if he had an ague. At the time I saw him it was about two hours after the accident had happened, during which he had experienced three of these severe shivering fits; the arms appeared much burnt, some parts of them were of a brown colour, and did not shew the re-action which slighter burns do, by quickly raising vesicles. The face and lips being severely burnt, there was reason to fear he might have inspired during his immersion in the flame, and injured the air vessels of the lungs in the same manner as the surface of the body. To relieve this (imaginary) symptom, a quantity of oily emulsion was given, and an anodyne draught at night, with thirty drops of laudanum.

*Second Day.*—He had passed a very restless night, with few intervals of ease, and those only of short duration; he had been frequently anointed with oil during the night; his pulse was 100, which was obliged to be felt in the groin, as the neck and arms were so swollen as not to leave any other convenient part. When the dressings were taken off, many more vesicles were observed to have formed on the legs, and also upon the neck and face; these were snipped with the points of scissars as the former; the extent of the burnt parts was much more easily perceived than yesterday; the colour of the injured surface, in most parts, was of a dingy red, as if stained by port wine. This colour may probably arise from some of the finer particles of the coal dust insinuating themselves into the pores of the cuticle, which are extremely difficult to be removed. I have sometimes endeavoured to wash them off with a sponge or a rag, and warm water;



but when the injury had been extensive, the attachment between the cuticle and the true skin had been so much destroyed, that the former was torn like a piece of wet paper, thus exposing the skin to the action of the air, in a state of exquisite sensibility. This ought therefore to be avoided, as the risk of injury is greater than the advantage to be gained. On the upper part of the arms, where the injury had been most severe, the colour was of a dirty yellow brown, shewing that the vitality of the skin in this part had been destroyed. He was anointed, and covered with plasters as before; a dose of purging salts were ordered, and the anodyne repeated.

*Third Day.*—The saline purge had procured two motions; notwithstanding which, he had passed a very restless night. There was a considerable tension in the arms. All the parts were again dressed as before; some febrifuge powders, with the nitrate of potass, were ordered, and ten drops more of laudanum were added to the anodyne.

*Fourth Day.*—Pulse 120; the urine was very high-coloured; the arms were considerably tumefied, and above the dirty yellow brown part, before described, there was an indurated thickening, somewhat raised, with an appearance of a fresh inflammation, more lively in its colour than that which was excited originally by the accident. Emollient cataplasms were ordered to be applied to the arms; the medicines were continued as yesterday.

*Fifth Day.*—Pulse 120; urine high coloured; he had no evacuation by the bowels since the operation of the purgative; he was ordered to have a purging enema, and to continue the

powders and his anodyne, as before. The inflammation, mentioned as having shewed itself upon the arms yesterday, still continued, and had become more extensive; in some parts it was an inch broad; the deepest and brightest red colour was immediately at the edge where the vitality of the skin had been destroyed; this marked line of destruction was caused by the arm-hole of the flannel waistcoat, the integuments under which were defended from the action of the fire; from this line the colour became less vivid, until it was lost in the natural colour of the skin. The appearance of the inflammation, excited around the edges of an eschar, produced by caustic, will convey a pretty clear idea of what I have wished to describe. The other injured parts of the body remained much in the state they were in before. There was no appearance of suppuration.

*Sixth Day.*—Pulse 130; the enema had procured a copious evacuation; the functions of the brain were much disturbed; he had been delirious during the greater part of the night; the tongue much parched, and he complained of great thirst. He was ordered a pint of saline julep, and to drink plentifully of apple tea; the anodyne to be repeated. The inflammation around the defined edges of the arms still remained, but there were several ash-coloured irregular spots on different parts of the arms where they had been most burnt; still there was no appearance of secretion of pus on the face, neck, or legs.

*Seventh Day.*—Pulse very quick, but not so strong as yesterday; the brain more affected, having been delirious the greater part of the night, and he appeared in a comatose state; had



frequently a hiccup after drinking, and sometimes his stomach rejected the fluids which were given him. He was ordered a cordial julep, and his anodyne. The ash-coloured spots, remarked yesterday, had increased in size and number, and appeared drier; the tumefaction was less than yesterday, though the inflammation remained, but not of so vivid a colour.

*Eighth Day.*—Pulse very quick, small, and fluttering; appeared in a constant stupor, from which he could not be roused; mouth parched, and incruited; hiccup still continued; the tumefaction of the integuments round the edges of the burn had disappeared, as well as the red colour of the inflamed parts; the whole of the burnt surface, which, for many days, had the dusky red colour, was now become of a dirty brown; the ash-coloured spots were of a blacker hue, resembling the colour of a mortification, excited by any other cause. The same cordial medicine was directed to be continued, with the anodyne.

*Ninth Day.*—He continued in the state of stupor described in yesterday's report, until early on the ninth morning, when he expired.

## CHAPTER IV.

SECOND MODE OF TREATMENT.—THE PRESENT ARDOUR IN SEARCH OF TRUTH PROMISES MUCH, BUT IS LIABLE TO ABUSE.—OBSERVATIONS ON THE CASE OF JOHN THOMPSON. —THE CASE OF JOHN CLARK; INTERNAL TREATMENT STIMULANT, EXTERNAL EMOLLIENT; LIFE PROTRACTED TO THE TWELFTH DAY.—THE CASE OF THOMAS JOHNSON; INTERNAL TREATMENT STIMULANT, EXTERNAL EMOLLIENT; LIFE PRESERVED, BUT THE CURE TEDIOUS, FROM TOO LONG A CONTINUANCE OF THE INTERNAL STIMULANT TREATMENT.

**I**N the preceding chapter, I have faithfully detailed the symptoms of an extensive and severe burn, which terminated in the death of the patient early on the ninth morning. Several other cases, which I had treated, and some which I had seen treated in the Newcastle Infirmary, might have been added; but as they all had the same fatal termination, and presented little variety in their symptoms, I thought the history of one case would shew the natural course of the complaint, more particularly as all the cases were under nearly similar circumstances. From motives already noticed, I have confined my observations to the more aggravated cases, believing that this method would enable practitioners to draw the



clearest inference, respecting the relative merits of the different modes of treatment.

The opinions collected in the former part of the Essay will shew, that the treatment of JOHN THOMPSON'S case was perfectly conformable both to the practice and opinions of the most orthodox in medicine and surgery. Probably, the antiphlogistic plan of cure was not carried to the extent which the older authors would have recommended, as bleeding had not been resorted to in all these cases; although, in one case, I was so much at a loss how to proceed to give relief, that I followed the advice, so strongly recommended by the authorities quoted, and tried bleeding; it gave no relief, nor did it appear to have been of any service, as the patient died in the same manner as the others. The blood was not sisy, nor was there any appearance of inflammation. It forcibly struck me, that the patient sunk more rapidly after the bleeding, than the others had done, who had not been blooded. The result of the case, therefore, determined me to avoid that evacuation in future.

It is with respect to the internal treatment of these accidents that we find uniformity of opinions among all preceding authors. They regarded a burn as an inflammation, to reduce which they recommended bleeding, purging, and, above all, a low diet. Their opinions had acquired sanctity from usage; and the doctrine of implicit obedience, inculcated by the schools, induced perfect submission. The licentiousness of the present æra,\* may induce us to throw off

\* This was written in 1797, during the effervescence of the French revolution, when the principles of all sciences were shaken to their very foundation.

such restraints, and fall into an opposite error. The temerity of our modern reformers may lead them to commit excesses; yet, should they expose absurd prejudices, the benefit done thereby to society will be permanent; and will be acknowledged when the remembrance of their follies shall be lost in oblivion. Certain it is, that the idea of inflammation in burns, has influenced the opinions and practice of all writers, from the earliest periods of medical history, to the present time. The relative association of all the combined means to overcome increased action present themselves to the mind, the moment the term inflammation is mentioned; and this magical term is always accompanied with the idea of bleeding, purging, and low diet.

As it appears to me, that the too general acceptance of the similarity of burn and inflammation has led to erroneous conclusions, I must, therefore, venture to deny that a burn is an inflammation, though it may, in its consequences, produce an inflammation. I may be wrong in this assertion; but at least it has the merit of novelty for its recommendation; and may lead others to doubt and think; by which means we may arrive at truth. Instead of inflammation, I regard the first action of caloric upon the system as an irritation; but this is not the period when this doctrine is to be unfolded.

The external mode of treatment, in the case already related, was according to the directions of VAN SWIETEN, in cases of what he terms "*irresolvable burns*;" which that undoubtedly was, in many parts, particularly in the arms. Though I firmly believe that other parts, by a different practice, might have been resolved; but



they were not. The external and internal treatment of this case, were perfectly accordant with each other ; the bland and oily applications, were in perfect unison with the emulsions, and low cooling diet. An unity of principle prevailed in the whole treatment, except in the emollient cataplasms. This exception may appear extraordinary : for, as far as they were emollient, they might certainly be classed in the same species of applications ; but as they are the best means of applying heat to any part of the body, in that view, they will class under a very different species, namely, the strongest stimulants.

In the case of JOHN THOMPSON, we observe a great part of the body exposed to the immediate action of disengaged flame, which, in some parts, as in the legs, produced an immediate reaction, with the formation of vesicles ; but, from the fire acting more violently upon the arms, the organization of the parts was destroyed ; which prevented their reaction, as they then had become dead parts, no longer capable of performing those functions which were assigned to them in health. In this state, these parts were in the same relative situation to the rest of the body, as a small part destroyed by a caustic. The cold shivering, which took place in the case related, is a symptom which I have not found noticed by any preceding author. It is a symptom, however, which I have always recognised in such accidents ; and, according to its violence, and its frequent repetition, I have been enabled to estimate the degree of violence done to the general system. The more frequent and violent the shivering fits are, the greater the febrile reaction. The fever, arising from the immediate irritation of a burn, I will

call the irritative fever. When the patient dies from irritation, it is generally previously to the fourth day; after that period, the inflammatory and suppurative fever appears to commence.— This is known to take place by the tumefaction and redness of the integuments immediately adjoining the burnt part.

According to the first mode of treatment, if the patient had not strength enough to throw off the eschars, or to commence the process of secretion, by which they were subsequently to be thrown off, by the eighth day, the system was exhausted, and he died of mortification. I am warranted in drawing this conclusion, from the sudden disappearance of the redness and swelling, and also from the ash-coloured spots becoming more livid or blackish. These external signs, joined to the hiccup and vomiting, leave no doubt in my mind of this important fact, viz. that death, in similar cases, arises from mortification.

Scarifications, in such circumstances, have been much recommended by many authors. Some, with the idea of preventing deeply seated suppurations, have been induced to make incisions through the integuments, until they arrived at the living parts; and then have applied warm stimulating digestives, to hasten the detachment of the eschars. Such practice as this might be admitted, if an eschar did not exceed the size of a crown piece; but in an extensive burn, where the integuments of an upper or lower extremity, or large portions of the integuments of the trunk, were implicated, it would be inadmissible. Besides, in a burn, such as I have described, the eschar or eschars will not shew themselves all at once, for they appear to increase in number,



extent, and intensity, according to the inability of the exertions made by the system to throw them off. This appears from the remark respecting JOHN THOMPSON'S case, on the seventh day, where I observe, "that the ash-coloured spots, noted yesterday, have increased in size and number." As these eschars, or mortified spots, do not appear until the system is exhausted by her fruitless exertions to bring on suppuration, it would appear cruel, at this period, to make scarifications, which would certainly increase pain, without the prospect of affording relief.

The termination of the case I have related, as well as of many others I had seen, all ending in unequivocal symptoms of mortification, determined me to alter my treatment, and proceed upon different principles. The ignorance and prejudices of the class of patients I was practising upon, obliged me to be very circumspect in the adoption of my means. It appeared to me that I should be enabled to make an alteration in the internal or medical treatment of the complaint, with greater facility than in the external treatment. In the former, their discrimination is not very nice. They have no objection to take as much medicine as may be given; but in the latter, or external treatment, they were severe critics, judging your merit according as your practice was conformable to their former habits. Having determined my plan of treatment, to endeavour to support my patient to the suppurative stage of the complaint, and to carry him past the hitherto fatal eighth day, I shall give the following history.

## CASE.

JOHN CLARK, aged 35, a workman at Willington colliery, in the neighbourhood of Newcastle-upon-Tyne, in the autumn of the year 1790, was in the mine when an explosion took place, by his candle inflaming a quantity of hydrogen gas, which had collected in that part of the mine, since he had worked there the day before. His clothing, at the time, consisted of a flannel waistcoat, without sleeves, flannel breeches, and woollen stockings. This covering preserved the parts it was in contact with to a certain degree, and left exposed to the more violent action of the flame the face, neck, and breast; also the hands and arms. From the account of his fellow-workmen, who were the nearest to him at the time, there is reason to suppose he might have inspired the flame, as they represented his cries as dreadful. He informed me, that as soon as the flames had left him, he was seized with a violent shivering fit, in the same manner as mentioned by JOHN THOMPSON; which was followed by intense burning pain.

I saw him an hour and a half after the accident, when he was trembling as if in a fit of the ague. Sixty drops of laudanum were given him immediately, in some hot tea. In cases where they were apprehensive of internal burns, oily mixtures were always given. To comply, therefore, with their prejudices, and not to defeat my own purpose, I added to a pint of the oily emulsion an ounce of camphorated tincture of opium. He took two grains of powdered opium, with some



aromatic powder, at night. The external treatment, in this case, was not intended to be altered ; he was, therefore, dressed, as in JOHN THOMPSON'S case, with soft ceratum flavum, thickly spread upon lawn paper, having been previously well anointed with rape seed oil.

*Second Day.*—He had passed a very restless night, and had suffered very severe pain, notwithstanding the quantity of opium he had taken; pulse 100. He had been profusely anointed with oil ; more than a gallon had been used since yesterday ; the greater part of which had been worse than wasted, as it had been retained upon the bed and bedding, which, with the heat of the patient, and the confined atmosphere of a small room, generated a most offensive odour. The hair on one side of the head was much burnt ; it appeared to have saved the part underneath, as the scalp did not seem much affected ; but the neck, at the roots of the hair, had been injured, as appeared from several vesicles having arisen. The extent of the injury was more defined than it had been on the first day ; the different colour of the sound and unsound parts was more easily discriminated. The greatest portion of the injured surface carried the same dull, red appearance, as that described in the former case ; but under the right arm, and in the axilla, immediately where the flannel waistcoat terminated, the action of the fire had been very severe : for this part had not the dull red colour already described, but was a brown colour, as if the fire had deprived it of life, and partly charred it. The dressings were continued as before.

The uniform termination of severe cases on the eighth day, made me determine to commence

my new plan of treatment, at an early period, hoping, that by supporting the energy of the system, it might be enabled to throw off the eschars, and proceed to the second or secreting stage. From the symptoms of mortification shewing themselves at the last periods of the complaint, I was induced to exhibit the bark, and began with it at this early period, being well convinced, that it is much better to prevent the appearance of mortification, than to remove it when it has taken place. He was therefore ordered to take a drachm of the bark, with half an ounce of the compound tincture, and ten drops of tincture of opium, every two hours, in a cordial draught; and an anodyne at night, with sixty drops of tincture of opium. It was not only in medicines that this alteration of plan took place, but also in his allowance of diet. He was now permitted such food in the first stage, as had formerly been ordered in the second: for when secretion took place in the former method, the quantity of pus was excessive; therefore, to support the patient under this discharge, the food was ordered to be plentiful and nutritive. He was allowed gruel, with ale, for breakfast and supper, strong broths for dinner, and port wine negus for common drink.

*Third Day.*—Had been restless and uneasy since the report of yesterday; his slumbers during the night had been short and disturbed; the general appearance of the injured surface was little changed, except the right arm, which began to have a degree of tension and tumefaction, characteristic of inflammation taking place. An emollient cataplasm, formed with linseed oil, to a quart of which an ounce of tincture of opium



was added, and the crumbs of bread, was applied to the whole of the right arm. The medicines were continued as yesterday; in addition to which, a cordial anodyne, with sixty drops of tincture of opium, was ordered to be given in the morning, two hours previously to the period for renewing the dressings. The bowels being confined, probably by the quantity of opium, a powerful cathartic enema was ordered.

*Fourth Day.*—Pulse 110, full and strong; the enema had procured a free evacuation. Though he had taken frequent and large doses of opium, he did not appear so affected by stupor as those I had previously attended, who had taken it only in small quantities at bed-time. He took his stimulating and nourishing food with pleasure, and had also taken his medicines regularly. The right arm was a little more swollen, and the face was puffed up about the eyes. In other respects, the appearances were as yesterday.

*Fifth Day.*—The swelling of the face still continued; the integuments adjoining the burnt part in the axilla were considerably tumefied, extending on the trunk, over the pectoral muscle; and on the arm over the deltoid. A line of fresh inflammation was observable round the eschar, and the whole of the limb had more tension than before, from the eschar to the hand. The emollient cataplasms were repeated, and the medicines continued as before.

*Sixth Day.*—Pulse 120. The appearance of the parts had undergone little variation since yesterday; no evacuation by the bowels had taken place since the last enema, which was ordered again to be exhibited; a dose of calomel and aloes was ordered to be given at night, and the other medicines and diet continued.

*Seventh Day.*—There appeared little alteration in the aspect of the morbid parts, except that the line of inflammation, by the eschars, had spread itself a little in breadth, resembling, in some degree, the appearance of inflammation from erysipelas. The re-appearance of inflammation, at this period, induces a belief in the minds of the friends of the patient, that the fire had not been properly *killed* at the first. It is difficult to convince them that this is not the case. This inflammation evidently arises from the obstruction of circulation through the eschars, and is an effort of nature to throw them off, and to restore the surface to its natural functions, namely, a secreting and absorbing surface. He had found relief from the enema; the pills were to be repeated at night. I was induced to give aperients in that form, being anxious to avoid exciting nausea, or unpleasant feelings in the stomach, at that critical period, as I had found, in all those cases which had terminated fatally, that it was the organ which had been the first to give unequivocal symptoms of approaching mortification. As that effect had hitherto taken place on the eighth day, it was, according to my new plan of proceeding, of the utmost importance to avoid such a termination. He had hitherto taken his generous diet, and his cordial medicines, with anodynes, cheerfully; he was therefore ordered to continue them.

*Eighth Day.*—His pills had produced an evacuation; had not taken his food with the same avidity as before, though the stomach retained what it took; twenty drops of æther were added to each dose of the bark, and laudanum, and half a drachm to the morning and evening



anodyne. The injured surface had much the same appearance, nor was there more moisture on the surface than what seemed to arise from the nature of the applications. The eschars had not yet commenced a suppuration.

*Ninth Day.*—Pulse 125 ; the urine highly-coloured ; the stomach still performed its office, and retained what was given ; no suppuration of eschars, or secretion of pus. Continued the same medicines and diet.

*Tenth Day.*—Some small vesicles had appeared upon the eschar in the axilla, which, when punctured, emitted nothing but gas ; that symptom, so general in mortifications, taking place in different parts of the body, from any other cause, convinced me that I was right in the opinion I had formed, as to the termination in such cases. For when the patient lived to this period, and then died, such symptoms always occurred ; but if he died prior to the fourth day, no such symptoms took place. In that case, the patient appeared to be exhausted by pain and the irritative fever. In several cases, I have seen the patient die on the third day, in a state of coma, where very small doses of opium had been given ; whilst in other severe cases, where large doses had been freely administered, no such effect was produced. The skin beneath the vesicles was of an ash-colour ; there was no secretion ; nor had the eschar separated ; but the inflammation still continued. His stomach still retained what was given, but he was more averse to his food and medicines. The bowels had not been moved ; he had, therefore, the purgative pills.

*Eleventh Day.*—Pulse 135 ; the swelling and inflammation of the arm much lessened ; he had

rejected his medicine twice, and his food once; had frequent hiccups; as much wine as he would take was ordered him; had considerable stupor.

*Twelfth Day.*—Pulse very quick, small, and unsteady; had remained in a comatose state since the last report; the swelling and inflammation had entirely subsided; the mouth was parched and dry. He continued in this state until the evening, when he ceased to breathe.

The result of this case was calculated to make a strong impression upon my mind, though it did not terminate favourably; yet, the treatment having prolonged existence, and retarded the unfavourable symptoms, I was induced to think myself in the right direction: for, had the injury been a slight degree less, or the means of exciting the action of the system some degrees more, I think the eschars would have suppurated, and then I might have saved the patient. As this practice was so diametrically opposite to the positive directions of every medical author, both ancient and modern, whose works I had consulted, to find it likely to succeed was a source of no small gratification, and a strong incitement to persevere in the same train, to establish the fact. The responsibility of a practitioner, who dares to run counter to the practice and experience of all his predecessors, is truly great; and it induced me to be extremely attentive to ascertain the safety, the propriety, and the justness of so novel a practice. But these observations will be more clearly illustrated by reciting the history of the following



## CASE.

THOMAS JOHNSON, a young man, aged 20, a workman in the coal-mine at Willington, near Newcastle-upon-Tyne, was exposed to the action of flame, disengaged from inflammable air, in the summer of 1791. He had no other dress to guard him from injury than a pair of flannel breeches, and stockings; these saved the lower limbs; the whole of the upper part of his body was consequently exposed to the injury. He said he threw himself upon his face as soon as he found his situation, by which means the fore part of his body had not been so much injured as the back part, neither the mouth or the nose being burnt. I had no doubt, in my own mind, of his being free from internal injury; it was therefore unnecessary to pursue the use of the accustomed oily remedies. This circumstance I rejoiced at, as I had thought the powers of the stomach were weakened by the adoption of such means. To support the patient to go through the suppurative stage of the complaint, was the mode I had adopted; to accomplish which, so much depended upon the stomach, that I was anxious to avoid every thing which might offend that organ. I therefore lost no time, but immediately began the internal stimulant plan of treatment. A cordial draught was immediately given, with fifty drops of laudanum, and to be repeated at night; a cordial volatile julep, with peppermint-water, to be taken during the day; and the diet was allowed to be as good as he could take; with strong port wine negus for common drink. The external means were the same as already

described in the preceding cases : for I had as yet merely contemplated the prevention of mortification by general remedies acting upon the system, by unfolding its energies ; to which I had hitherto met with no difficulty, from the prejudices of my patients, in administering. The shivering, observed in the other cases, was also present in this, for he was in a constant shake during the whole of the visit.

*Second Day.*—Had passed a very restless night ; had but few and short intervals of ease ; the injured parts were more defined than at first ; a large part of the abdomen and breast of a dull, dusky red. The left side, and the upper part of the left arm, had the same appearance ; but the back, from the nape of the neck to the waistband of the breeches, had a different colour, more inclining to brown in some places, like burnt parchment. The opiates and cordial, with the generous diet, were continued.

*Third Day.*—Pulse 110 ; had no evacuation by the bowels since the accident ; a powerful cathartic enema was ordered ; five grains of calomel were given at night ; the other medicines were repeated as before. The injured parts were not changed in appearance.

*Fourth Day.*—The enema procured a copious evacuation yesterday, and the calomel had moved him in the morning ; half a drachm of peruvian bark, in an ounce and a half of the decoction, with half an ounce of compound tincture of bark, was given every three hours ; the night and morning anodynes continued ; the diet as before. The left arm began to be tense and swollen, indicative of inflammation taking place, as a necessary effort of the constitution to throw off



the disorganised parts. It is not necessary to treat this inflammation as we should treat that of an organ necessary to life, as of the lungs, or the liver: for the parts killed by the fire not being necessary to life, it will be sufficient if we enable the system to disembarrass itself of this dead matter. The treatment of inflammation of the internal viscera, which, if not checked by bleeding, and the antiphlogistic diet, would end in suppuration and death, has led to the recommendation of the same means in cases of burns, though in these cases suppuration is safety. In other respects the appearances of the parts were as yesterday.

*Fifth Day.*—Pulse 120; urine high-coloured; the arm more tense than yesterday. Medicines and applications as before.

*Sixth Day.*—No variation in appearance, or of treatment.

*Seventh Day.*—The plasters taken from the breast appeared more moist than they had been hitherto. This was a gratifying sight. It convinced me that the system was again likely to perform its functions, and that the surface might again become a secreting and absorbing surface, like the skin, in its natural state. Some of the edges around the burnt parchment-like places on the back, had commenced the thickening process, and began to swell and inflame, like the edges of an eschar, formed by caustic. Medicines and diet continued, without alteration.

*Eighth Day.*—The moisture, which appeared upon the breast yesterday, bore evident marks of laudable pus; secretion having taken place, the application of oil, as a liniment, was discontinued; the inflammation and thickening, close to the edges of the eschars, on the arm and back, much

in the same state. The bowels not having been relieved since the operation of the calomel powder, it was repeated. Medicines and diet as before.

I have thus continued the account of this case in the form of a journal; thinking it necessary to keep that form until the system had reassumed the secreting action upon the surface; having, in all the cases I had seen, considered that as a certain criterion of the future safety of the patient; though I can very readily conceive cases, in which it would not be the consequence. As it was above a twelvemonth before this case was perfectly cured, it would have been both useless and tedious to retain the diurnal reports. I shall, therefore, in a summary manner, notice the chief symptoms, and the mode of treatment during the process of cure.

Although a part of the injured surface was secreting, a very large part remained, which was prevented performing that function, by broad and deep eschars formed upon the neck, shoulders, back, left side, and left arm. On the thirteenth day, there was some appearance of the eschar separating in a small portion on the lower edge of the left arm; and in a few days more, pus was abundantly secreted. About the twentieth day, some of the eschars upon the back began to separate; the thickening, and subsequent separation around the whole extent of the eschars, gradually proceeded, and was followed by a profuse secretion of matter. The throwing off such broad and deep sloughs, was a tedious process, and very distressing to the constitution of the patient. As the eschars became partly detached, the loose



floating portions were cut off, as closely as could conveniently be done, without injuring the living part. Full three months elapsed before the last portions of the eschars were detached. The eschar which remained the longest was situated upon the spinal process of the scapula ; from its structure and tenacity, it appeared to include some tendinous fibres of the trapezius muscle, which are inserted to that part.

The surface of the abomen and the breast, being those parts which were the least injured, first began to form matter, when the oily applications were desisted from, and lapis calaminaris cerate was substituted ; by this change of application, the parts put on a healthy aspect, and healed readily ; but it was far otherwise with those surfaces where the eschars had destroyed the true skin, the adepose membrane, and had bared the muscular fibres. The loss of substance was speedily supplied by a loose fungus, of a spongy texture, which obstinately resisted all efforts to give it firmness. As this disposition shewed itself at an early period, that is, long previously to the total separation of the eschars, the parts were washed with a variety of astringent applications, such as the acidulated infusion of roses, lime water, &c. Finely levigated lapis-calaminaris was plentifully applied, as an absorbent ; upon which dry lint was then placed, in such quantities as to hold the discharge until the following dressing : these were covered by plasters, spread with calamine cerate. Such applications being insufficient, recourse was had to stronger means. Solutions of vitriolated zinc, and the aqua cupri ammoniati, increased in strength as it lost its effect by habit, were substituted.

In treating extensive sores of this nature for a long period, however proper the applications may be at the time, the parts become so accustomed to their action, that they cease to cause the salutary effects which they produced upon their first application. It may, therefore, be necessary to choose a variety of applications, which, though apparently the same, may be so managed as to produce good effects by a frequent change. Whoever has had the treatment of an extensive sore, such as the one I am now describing, will duly appreciate the effects of caustic astringents, in repressing the too luxuriant growth of fungus. A solution of the nitrate of silver, or touching the edges slightly with the nitrate itself, will be found extremely efficacious. When the part is so situated, that compression can be made conveniently by bandages, the fungus will be materially prevented by such means. The application of straps of adhesive plaster, now so generally used in the modern judicious treatment of ulcers, will, in many cases, be of great service. It is, however, impossible to say precisely when or how long any application should be employed, as nothing but the *oculus eruditus* of an experienced practitioner can be a proper guide.

Having thus given a brief account of the external treatment of this case, from the eighth day to its final termination in a perfect cure, through an extent of time beyond a year, I shall now revert to the line of conduct pursued in the internal treatment.

In the first case of JOHN THOMPSON, it will be remarked, that, when the treatment pursued was antiphlogistic, and consonant to the directions of every medical writer, from the earliest to the



present period, the patient died on the eighth day. He had passed the period of irritation, when patients die from pain and exhaustion, previous to the fourth or fifth day; and had proceeded to the stage of inflammation, arising from the obstruction of the cutaneous and capillary vessels. This state was marked by the swelling, tension, and redness about the eschars. The system not being supported, it was overpowered by the obstruction, and sunk into a state of mortification.

In the second case of JOHN CLARK, it will be seen that I was influenced by the above motives; and began, at an early period, to support and urge the system to accomplish its work, and throw off the eschars. The plan succeeded to a certain extent; it carried my patient considerably beyond what I had hitherto regarded as the fatal period. The efforts of swelling and inflammation were more vigorous and energetic, and though they ultimately failed in accomplishing the purposes I had in view, yet I was so convinced of the superiority of such means, that I determined to pursue the same plan on the first occasion.

In this case of THOMAS JOHNSON, by vigorously pursuing the internal stimulant plan, I had the high gratification of bringing my patient through the irritative stage, the inflammatory obstructive period, to that state of purulent secretion which I had ever regarded as one of safety. Having, by this deviation from former practice, brought my patient to a plentiful secretion of matter, I again recurred to the directions given by authors, and endeavoured to support my patient, and keep up his strength, by tonic medicines, and a generous diet. These means

maintained the excitement of the system ; and though necessary, in the first instance, served now to keep up a constant fever, by which I had nearly destroyed my patient. I do not mean to say that all the train of unfavourable symptoms could have been entirely avoided ; but I freely confess, that they might have been rendered more mild and tractable, by means which I shall hereafter describe.

During so long a period as this case included, it was as necessary to change the medicines, as the different external applications ; the effect of habit rendering the system, after a time, insensible to their action. The brown, the yellow, and the red bark, had each their turn ; and these again were superseded by different bitter infusions. Of the utility of such means in the latter stages, I am very doubtful ; however, by the above plan, the case terminated favourably. Though doubts may be entertained respecting the treatment of the latter period, yet I have no doubt as to the utility of the first part, nay, its absolute necessity, to bring the subject through an extensive and dangerous injury of this description.



## CHAPTER V.

THIRD MODE OF TREATMENT.--OBSERVATIONS ON THE PRECEDING CASES.--CHANGE OF TREATMENT INDICATED, WHICH WAS AT LENGTH ESTABLISHED ON THE FOLLOWING PRINCIPLES.--EFFECTS OF HEAT AND COLD.--OF INJURIES PRODUCED BY FIRE ; NECESSARY REMEDIES, AND THEIR MODE OF ACTION.--DIVISION OF BURNS INTO TWO CLASSES ; 1ST. WHERE THE ACTION OF THE PART IS ONLY INCREASED ; 2D. WHERE THE ACTION OF SOME PARTS IS INCREASED, AND SOME PARTS DESTROYED.--TREATMENT OF THE FIRST CLASS.--TREATMENT OF THE SECOND CLASS.--CASES OF JAMES JACKSON, MR. GLYNN, THOMAS SMITH, MR. HOPPER.

**I** HAVE already remarked, that the termination of the first mode of treatment, in extreme cases, which appeared evidently to take place from mortification, left no doubt in my mind that the whole train of symptoms was the consequence of debility, from the exhaustion of the vital power by excess of action. The excessive stimulus of fire, and the irritative fever kept up from this stimulus, exhausted the system, without producing that curative effect, which the fever is meant to produce, (I would say) by suppuration, or secretion upon the surface. I wish it to be understood, that the doctrines of all my predecessors on this

subject have inculcated the severe evacuant, cooling, and antiphlogistic method of treatment, to overcome the inflammation arising from injuries occasioned by fire.

The termination of several cases in gangrene first induced me to change the internal mode of treatment, and substitute that which, in cases of mortification from other causes, I had found most efficient. To have waited until symptoms of gangrene took place, would have defeated my own views ; I therefore began at an early period, before the actions of life were sunk too low to be recalled to act with vigour. The cases related in the second mode of treatment, carry such conviction of the superiority of the means used, that the least attentive observer must be forcibly struck with the difference.

In the first case of JOHN CLARK, we may observe that his life was sustained, for a considerable period longer than it would have been had it been conducted on the principles of the first mode of treatment. This case, though not so fortunate for the patient as the next, yet, as establishing the principle, is infinitely more important to elucidate and determine the propriety of the practice, than the other. If, where two patients are so severely burnt as to destroy life, the existence of the one can be continued some days longer than the other, by a different treatment, it is natural to conclude, that the mode which preserved life the longest is the best. The truth of this conclusion is strikingly corroborated by the result of THOMAS JOHNSON's case, who, by the internal stimulant plan, was carried through the irritative to the suppurative stage of the complaint, and finally to a perfect cure, though we shall afterwards see that the latter part of



the treatment was injudicious. The result of THOMAS JOHNSON'S case naturally leads us to suppose, that had JOHN CLARK'S injury been a shade less, or the treatment more energetic, his case would have terminated as favourably as the other.

I have already mentioned, that the termination by gangrene induced me to begin, at an early period, with the treatment I had seen successfully pursued in mortifications at the hospital. I had fewer prejudices to overcome by this practice, amongst the class of people that formed my patients, than I should have had if a change of external means had been proposed. A generous diet is congenial to the habits of those around them ; they live well, when well ; and they think that what does them good in health, cannot do them harm when they are ill, if they have the inclination to take it, and the ability to get it. I am also indebted to the success of the second mode of treatment, for inducing me to undertake the investigation by which I have been led to lay down principles for the treatment of all such cases in future. The quotations already made will bear me out in the assertion, that all the practice hitherto has been empirical. Had I been induced at first to have used the class of topical remedies, which I shall presently recommend, I have no doubt but that I should have obtained such benefits from their application, as totally to have done away the necessity in my mind of further investigation. As the series of failures which I experienced led the way to the success which I afterwards obtained, I have candidly exposed the whole for the information of the profession. The success of the second

mode of treatment shewed me the errors of all systematic writers on this subject, up to the time I first wrote my essay in 1797.

I shall not trouble the reader by enumerating the various theories which passed through my mind, to explain the success of my treatment, but proceed to shew the principles upon which my practice is founded. For this purpose, I shall investigate some of the effects of heat and cold.

#### ON THE EFFECTS OF HEAT.

We shall take a cursory view of some of the phenomena of heat, as far as our present knowledge of the subject will enable us so to do.

Heat is the well-known sensation which we perceive on touching any substance whose temperature is greater than that of the human body. Chemists have agreed to call the matter of heat *caloric*, in order to distinguish it from the sensation which this matter produces. The sensation of heat and cold arises from the tendency which caloric has to diffuse itself equally amongst all substances that come in contact with it. If the hand be put upon a hot body, part of the caloric leaves the hot body, and enters the hand; this produces the sensation of heat. On the contrary, if the hand be put upon a cold body, part of the caloric contained in the hand, leaves the hand to unite with the cold body; and thus the sensation of cold is produced.

The common acceptation of the terms, hot and cold, is so vague, that the same substance may, at the same time, be pronounced both hot or cold



equally. If a person, just emerged from a cold bath at 40 degrees of Fahrenheit's thermometer, and another person just coming out of a hot bath at 112 degrees, should each touch the same piece of glass at 70 degrees, they would give a very different account of their sensations. The glass would appear cold to the person quitting the hot bath, and warm to him who quitted the cold one. Independently of this deception of the senses, cold is generally regarded as a lesser degree of heat, for we are not yet acquainted with positive cold. But this is a point upon which philosophers are not as yet agreed. Some think caloric merely the consequence of a peculiar motion among the particles of bodies, and that it has no independent existence of motion, any more than sound. Others have supposed that it is really a distinct substance, which exists independent of any other. Such are the opinions of the philosophers of the present day, the latter of which gains ground. But these are abstract questions, which I need not here attempt to solve. I shall therefore proceed to investigate the effects of different degrees of heat upon the human body. First, I shall describe the effects of the minimum of heat, or, as it is generally termed, cold; then I shall describe the effects of the maximum, as heat, in its common acceptation, or caloric. In this investigation it will merely be necessary to observe the effects of different degrees of temperature, above or below the freezing point of the thermometer, which destroy the healthy action of the living subject, when submitted to their influence.

EFFECTS OF HEAT BELOW THE FREEZING  
POINT, COMMONLY KNOWN, AND REGARDED  
AS THE EFFECTS OF COLD.

All animated beings are endowed by nature with certain means of self preservation. When they are assailed by any noxious power, they exert these means of self-preservation according to the laws given to them with their existence. Even vegetables are endowed with this law of self-preservation, as well as animals ; they bear the want of heat several degrees below the freezing point ; but, if the heat be suddenly abstracted, after wet weather, or a thaw, the fluids contained in their vessels lose their vital power, and follow the law of dead matter in respect to congelation, with a lowered temperature. Thus, in a severe winter, a great number of plants and trees are killed by the sudden effect of the subtraction of a few degrees of caloric. Trees are frequently split, with a considerable report, under such circumstances.

Animals possess this power of self-preservation in very different degrees : in some of the lower species, it exists when the temperature of the surrounding medium is some degrees below 32 of Fahrenheit. The earth-worm, when placed in a medium some degrees below the freezing point, does not take on the same degree ; but, by the exertion of its vital powers, keeps itself above that temperature, until its power of resisting cold are exhausted, when it dies, and takes on the temperature of the surrounding medium.

The more perfect the animal, the greater are its powers of resistance to the noxious effects of



a diminished temperature. Though man is not clothed by nature to defend himself from cold, equal to many of the inferior species of animals, yet, when we behold the advantages he acquires from his reason and experience, in banishing unpleasant sensations, by various contrivances of art, he has no reason to envy the fleecy covering of the sheep, nor the warm fur of the fox. But notwithstanding the aids which man is enabled to acquire by his experience, he is sometimes so circumstanced as to be exposed to a sudden diminution of heat. This happens most frequently in Siberia, in Switzerland, in Canada, and sometimes on the Andes. There are instances recorded, however dubious their authority, that some of the insatiable conquerors of the new world, in the beginning of the sixteenth century, rather than take a circuitous march round the mountains of Peru, in search of gold, attempted to cross over the mountain of Antisona, where neither their thirst for the precious ore, nor all the passions which it inspired, could prevent their suffering from want of heat. Nay, some narrators go so far as to affirm, that, being withdrawn, they remained fixed in the very attitude they were in at the moment of its abstraction, and that in such state they were found above a century afterwards!

Travellers in the more mountainous parts of Switzerland are sometimes attacked, particularly on horseback, with a great desire to sleep; if they do not resist this inclination, they soon fall a sacrifice to a universal torpor. Death, proceeding from this cause, does not appear, from the relation of those who have escaped it, to be painful. The surface of the body is the part

which first loses its motion, or vitality. In Canada, when a traveller is thus seized, and appears to be dead, his companions bury him in the snow for the night, and on the following morning he is generally found in such a situation as to be enabled to pursue his journey. But if he appears slow in coming to himself, they throw a little warm litter about him, which, being several degrees warmer than the freezing point, produces an appearance of a gentle thaw, and this is found a sufficient stimulus to excite the suspended functions of life. These are the effects of a low degree of heat, when continued for some time. It is not uncommon in countries, where, during a great part of the year, the heat is much diminished, to observe several persons, who have lost a part of their nose, or ears, from this cause.

That accurate and ingenious physiologist, the late Mr. JOHN HUNTER, observed, in the year 1776, that the combs of his cocks in the country were smooth, with an even edge, and that they were not half so broad as formerly, appearing as if one-half had been cut off. He inquired the cause of this appearance of his servant, who informed him, that it had been common, during the hard frost, for part of the combs to become dead, and then to drop off. Mr. HUNTER imputed this to the effects of cold, which deprived the part of its vital power, and was then subsequently detached. He endeavoured to ascertain the fact by an experiment: for this purpose he attempted to freeze the comb of a young cock, by putting it into a freezing mixture of salt and ice, at zero of the thermometer. The comb itself was thick and large, and resisted being frozen;



but the serrated edges of the comb, which were half an inch long, were perfectly frozen. They were white and hard, and when a piece was cut off, it did not bleed; nor did the animal shew any sense of pain. He next introduced into the freezing mixture, one of his wattles, which was very broad and thin; this froze readily. On thawing, both the comb and wattle became warm, but were changed from red to a purple colour, having lost the beautiful transparency which remained in the other wattle. The wound in the comb, upon thawing, bled freely. It was near a month before the frozen parts were well, and returned to their natural colour, which they did nearest to the sound parts first, and gradually proceeded, until the whole had reassumed their former aspect.

Mr. HUNTER also froze the ears of rabbits in the freezing mixture; they became hard and stiff, and, when cut with a pair of scissors, flew from between the blades like pieces of brittle chip. When thawed, they began to bleed, and were very flaccid, so as to double upon themselves, having lost their native elasticity. When out of the mixture about an hour, they acquired warmth, which increased to a considerable degree; they also began to thicken from inflammation, and retained the increased warmth for several days.

From these experiments of Mr. HUNTER, it would appear, that the vital action of parts, when exposed to a diminished temperature, is suspended; for when the comb of the cock, or the ear of the rabbit, was cut, there was no appearance of circulation, nor expression of painful sensation. The suspension of action in a part of the system, caused by the above means, may, by proper care,

be restored to a unity of action with the whole. When such accidents happen, for instance, to the hands or feet, they restore the action by rubbing snow upon the frozen parts, as snow is warmer than the atmosphere to which they were exposed. After the snow, the coldest water is applied, as being some degrees warmer than snow. Thus gradually exciting action in the torpid parts, by cautiously increasing the stimulus of heat, and waiting until the part has been excited to action by one degree of stimulus, before an increased degree be added; through such means the whole may be recovered. If these precautions are not attended to, and the stimulus of too much heat be suddenly applied, the parts will be excited to excessive action, and soon exhaust their vital powers; the consequence must then of necessity be a speedy mortification.

On this review of the phenomena which take place in the disease termed *frost-bitten*, we perceive that it depends upon the cessation of action in the vessels of the part, or parts, exposed to the sudden diminution of the temperature, or the deficiency of the stimulus of heat. The mode of relief in this accident is, a cautious and gradual restoration of the action of the part by small additions of temperature, until it can bear the accustomed heat, and take up the action of the vessels to which it is attached; thus restoring a unity of action to the whole system.—Should the injury be of a magnitude to require medical aid by internal remedies, all such as are warm or stimulating ought to be avoided; for whatever would increase the action of the heart and arteries, would increase the disease; as it would augment the disparity of action between



the system and the torpid part. The means of cure are, therefore, to increase the action of the part, by an increased degree of heat ; and to diminish the action of the system, to meet the reduced action of the torpid part, so as to form a unity of action throughout the whole. If this treatment be not strictly and judiciously attended to, a solution of continuity of action takes place, and the part which had been frozen, being no longer a conductor of the circulation and vital powers of the system, becomes as it were a dead part, and requires a process of the system to detach it from the living parts, as in cases of mortification arising from any other cause.

From the above facts, it appears to me, that we may regard the following as an established law of the constitution, namely :

*Whenever the action of a part has been considerably diminished by withholding an accustomed stimulus, the reapplication of the stimulus so withheld (or any other, with the intention of making up the deficiency) must be very cautiously administered, until the part be gradually restored to its former healthy action.*

Having pointed out the law by which injuries, arising from the diminution of caloric, is to be treated, I shall next proceed to shew the principles upon which injuries, arising from an excess of caloric, should be treated.

**SECONDLY.—OF THE EFFECTS OF HEAT ABOVE  
THE FREEZING POINT, CARRIED TO THE  
EXTENT OF WHAT IS GENERALLY TERMED  
BURNING.**

All animals have the power of keeping themselves at the same temperature, or nearly so, when exposed to a medium several degrees both above and below the freezing point. The more perfect the animal, the greater will be the range of its power of accommodation. The experiments of Messrs. BLAGDEN, SOLANDER, and BANKS, who remained in a room for some time, which was heated to 260 degrees of Fahrenheit's thermometer, shew the powers we have of resisting the effects of a high temperature of heated air. Perspiration, and evaporation from the lungs, appear to be the processes which nature has established for resisting the effects of heat thus applied.

The Abbé CHAPPE informs us, that the Russians pass hours in their vapour baths, at the high temperature of 160 degrees of Fahrenheit's thermometer, from whence they immediately plunge into the cold stream, not only with impunity, but with the most beneficial effects, both in the cure and the prevention of diseases. It is not my intention, at present, to point out the effects of the reaction of the system from temporary variations of heat, but to shew the primary effects of a sudden addition of caloric, for the purpose of pointing out a rational cure.

To illustrate the effects of heat upon the circulation of the blood, I went into a vapour bath when my heart was beating 60 strokes in a



minute. The range of the thermometer during my stay in the bath, was from 100 to 116. When I had been immersed some minutes, my pulse gradually began to rise; and when I had been in for twenty minutes, it was beating 130 strokes in the minute. From frequent repetitions of this experiment, there is no doubt but the most common and most decided effects of heat upon the system is to quicken the circulation of the blood, and increase the sensibility of the whole system. If caloric be gradually applied, the increased action is propagated from the point of contact, to the rest of the system; but if the heat be suddenly and violently applied, parts of the vessels to which it comes in contact lose their organization, and cease to be conductors. Thus, parts of vessels which, a moment before the application of caloric to them, were circulating fluids, and propagating nervous feeling, on a sudden cease to act, and become inert and dead matter attached to the living parts of the same vessels. To disengage these dead parts from the living, requires a peculiar process of the system. But there are various degrees between a slight increased action, and the total disorganization of the part. It seldom or ever happens that a part can be so totally and suddenly destroyed, but that some of the adjoining parts have had a sufficient quantity only of caloric applied to them to come within the limits of mere increased local action.

Injuries caused by a pernicious quantity of caloric suddenly applied to any part of the body, if the foregoing premises are just, ought to be termed *local injuries from increased action*. Most scalds are of this nature. The mode of relief,

in these dreadful accidents, will therefore be to restore the unity of action between the morbidly increased action of the part, and the rest of the system : 1st, By gradually diminishing the increased action of the part ; and 2dly, By increasing the general action of the system. Thus the disparity of action between the injured part and the rest would be less ; consequently, it would lead to a more speedy cure.

With this intention, holding the part to the fire is a very rational mode of relief ; but, as parts of the body may be injured where a cure by such means could not be carried into effect, it will be necessary to have recourse to other means. The strongest essential oils, the highest rectified spirit with essential oil, to which caloric may be added also, in such a degree as not to hurt the sound parts to which it shall be applied, are the species of applications calculated to do good, and to give the speediest and most effectual relief. These remedies are generally regarded and used as the strongest stimulants ; but in this case, they are neither regarded nor used as such : they are here used as sedatives, or powers less stimulant than those which originally produced the injury. These means are meant only for a limited time after the accident, and are then to be succeeded by milder applications : for, if the use of these were persisted in, they would cease to be sedative, and would excite an irritation similar to that which they were at first intended to relieve.

The internal means of relief will be to administer those substances which will, in the quickest and speediest manner possible, throw the heart



and arteries into the most violent action compatible with life. Thus, large doses of æther, volatile alcali, ardent spirit, opium, wine, &c. given in hot water, are what should be administered in the first instance. By these direct stimulants internally, the circulation will be carried to the greatest possible degree of quickness, by which means there will be infinitely less disparity of action between the part excited by the burn, and the general system, than by any other manner of treatment. By thus restoring a unity of action between the excited part, and the rest, the cure is to be performed. The propriety of practising upon these principles I hope to illustrate, in giving an account of the third mode of treatment.

Should these premises be granted, the following will be the law upon which injuries, arising from too great a quantity of caloric, should be conducted, namely :

*That any part of the system, having its action increased to a very high degree, must continue to be excited, although in a less degree, either by the stimulus which caused the increased action, or some other having the nearest similarity to it ; until by degrees the extraordinary action subsides into the ordinary action of the part.*

The various authors, who have written upon burns, have divided accidents of this kind into a variety of species. Their divisions have generally been arbitrary : sometimes they are taken from the agents by which the accidents were inflicted ; sometimes from the extent and depth of the local affection. HEISTER, as already mentioned, divides burns into four classes. FABRICIUS HILDANUS contents himself with three. As the

effects of caloric upon the system are, first, to produce increased action; and secondly, if carried to a greater extent, to destroy organization; it appears to me necessary to form the division of burns upon this simple principle. If, therefore, I am correct, the following will be the natural order :

1ST.—INJURIES FROM CALORIC, WHERE THE ACTION OF PARTS ARE ALONE INCREASED.

2DLY.—INJURIES FROM CALORIC, WHERE THE ACTION OF PARTS ARE INCREASED, AND THE ORGANIZATION OF SOME OTHER PARTS DESTROYED.

This easy division of injuries, arising from such a source, will include every possible variety. The fact of caloric increasing the action of any part to which it is applied, cannot be doubted; nor can the no less obvious fact of a greater quantity of caloric destroying the organization be called in question. Thus nature and reason appear to sanction this natural division. The treatment, upon this principle, becomes as natural and easy as it is efficacious. There is no necessity for doubt, or hesitation, or inquiry into what species of injury has taken place. To render this doctrine more clear, I beg to remark, that I never saw an injury of this kind where some parts were totally destroyed, but it produced, upon other adjoining parts, an increased action. Now, as it is our duty to save the living parts, or those which have their action only increased, our mode of treatment must always be the same.



To a disorganized part, or to an eschar, it is of no consequence what we apply : for the surface to which such application is made is dead, and incapable of being acted upon from without. To detach an eschar is a vital process, requiring all the energies of the system ; for, if the system in this contest be not able to throw off the dead parts, the fever excited by the conflict will exhaust the vital powers of the system, and death will be the consequence, as it appeared to take place in those cases, related both in the first and second mode of treatment. There may be a difference in the degrees of injury, but there can be no difference in the kind. A small or a large surface may have its action increased ; but still the injury will be one of increased action. Also a small or a large part of the system may be disorganized ; this will therefore class with injuries where parts are destroyed.

There is thus a clear decisive line of practice to be pursued in the first instance, namely, to preserve the living parts. In the course of three or four days, the disorganized parts will be more clearly defined, as the process of nature, to disembarass herself from these eschars, will be commencing. This process, as has been shewn in the second mode of treatment, must be assisted by keeping up the action of the system with stimulant medicines, and a generous diet. The eschars will be more easily detached by the frequent renewal of the stimulus of heat with cataplasms of bread and hot water ; some camphorated spirit, or essential oil, may be sprinkled upon the surface of them : or, if they are applied over plasters, spread with a digestive ointment, they will impart their caloric in a gradual and

useful manner. These means will only be serviceable until suppuration is established, for then a different mode of treatment must be pursued.

In a former part of the essay, I mentioned, that when suppuration had taken place, it was the general practice to order the patient a more generous diet, and more stimulant medicines; this was done with the intention of supporting the system under the increased secretion of pus, which was frequently excessive, particularly if the accident happened in warm weather. In the case of THOMAS JOHNSON, already described, this mode was adopted, and it was more than a year before he was cured. Certainly the case was a very severe one. The sloughs were extensive and deep; in some places, implicating tendinous fibres. These observations will account for its tediousness. Yet it is not unparalleled in point of time: for some cases have required two, three, or more years, and some have been incapable of being permanently cicatrised.

As I found, from experience, that the antiphlogistic plan, at the commencement, was erroneous, I began to apprehend I might be equally wrong in other parts of the treatment. To ascertain this, I determined to alter the latter part of the treatment. It was not long before I had a favourable case for the experiment. Accordingly, after I had urged on the system to the point of suppuration, I desisted from the use of excitants; and I had the pleasing satisfaction to observe, that the secretion of pus diminished, in a degree I never could produce before, and the healing process proceeded with a rapidity I had never as yet witnessed. The effects of this alteration of treatment will be most strikingly illustrated in the



case of Mr. GLYNN, which will be related; and where it will be observed, that the treatment recommended by all antecedent authors was totally inverted: for, instead of bleeding and purging at the commencement of the complaint, these means were resorted to at the end, in order to complete the cure.

From the foregoing facts it appears, that the system, during the time of suppuration, had been distressed and over excited by a too abundant supply of food and stimulant medicines; thus fatiguing the absorbents, in assimilating that which the surface of the wounds was obliged to secrete, and throw off as excrementitious. This effect has been observed in the case of THOMAS JOHNSON, where the system was excited by these means to a hectic action, such as flushings after eating, and febrile exacerbations in the evening. Though such symptoms left him in proportion as the wounds healed, I have no doubt but they were much increased, if not entirely caused, by the improper manner of treatment.

It will be seen, from the above observations, that the whole of the former treatment was entirely inverted. The soothing means, which were so strongly inculcated by the ancients in the beginning, both externally and internally, in accidents of this nature, and continued until suppuration appeared, are now totally departed from; as also the method of exciting the system when suppuration had taken place, under the idea of supporting the patient under the discharge. I have of late had reason to suppose that, in nine cases out of ten, the increased secretion was induced by the practice.

The practice I now recommend, is the reverse of this. When a part of the frame has been much excited, it should not be allowed to become torpid for want of stimulus, but have its excitement continued, though in a less degree, by a smaller quantity of the original stimulant, or some other of the nearest affinity to it, until, by degrees, the increased excitement is lowered down to the ordinary healthy action of the part. The system of the patient is supposed to be in a healthy state at the time of the injury. The internal means to be made use of are such as would stimulate the circulation to as great a degree as is compatible with safety. Thus, increasing the action of the sound part by strong stomachic stimuli, and diminishing the local excitement by decreasing the local stimuli, the equilibrium of action between the injured part and the sound, will be more readily restored. Should the application of caloric have been in such excess as to have disorganized some parts, yet I have always observed that other parts have only had their action increased. The preservation of the living parts must therefore be the first attended to, and it fortunately happens that the best mode of preserving these, is that by which the system is best enabled to disembarrass itself of the disorganized parts. When suppuration takes place, the excitement of the system by stimulant medicines and generous diet, must be desisted from. Should the secretion of pus be profuse, a spare diet, and occasional purgatives, might be necessary. The great art of healing sores of this description depends upon nicely balancing the secretion of the exhalent and



absorbent vessels upon their surface. When purulent secretion is redundant, a counter-irritation upon the mucous membrane of the bowels is very useful ; it causes a salutary revulsion. The too great secretion of pus may be much influenced by attention to diet. The former mode of supporting the system during the whole progress of the suppurative stage, obliged the system to convert the sores into drains, by which it might relieve itself from the excess of excitement. It frequently happens that parts which have been injured from burns, remain weak and irritable, and liable to inflammation, as the angles of the mouth, the nostrils, the ears, and, more particularly, the eyes ; in such cases, topical bleeding, or even bleeding from the arm, may be useful. Should medicine be necessary, to keep up the tone of the patient's system, doses of powdered cinchona, given in milk, two or three times a day, will best fulfil that intention, as it will produce tone without quickening the circulation, which ale, wine, or spirits, generally do.

By attention to these general principles, I can truly assert, that I have cured many extensive and dangerous burns and scalds, in one, two, three, and four weeks ; which, by the former method, would have required as many months ; and some also, which I can assert would have been *incurable* by the former method.

It will readily be supposed, that, whilst investigating these principles, I had frequent opportunities of appreciating the relative value of a variety of applications. At the same time, when I point out those applications which I have found the most efficient, I by no means intend to assert that they may not be exceeded ;

I only mean to exhibit them as those which, with me, have best answered my purpose. But if the principles are just upon which the remedies are chosen, and if they be clearly stated, every practitioner will be led to a proper class of curative materials, from which he may form his own selection.

*Oily Applications.*—When I speak of oily applications to burns, I would intend olive, rapeseed, linseed, and almond oils, or in general, any oil which has been obtained by pressure from the emulsive seeds or kernels of vegetables. The great degree of smoothness which they possess, and their being void of every irritating quality, when applied externally to a sound part of the skin, would appear to have led to their so frequent application. There certainly are cases in which their being applied to the surface of the body may be useful. Mr. JOHN HUNTER recommended his pupils to rub olive oil over their hands, when dissecting, to prevent the absorption of animal poison. At Smyrna, in times when the plague rages, frictions over the whole of the body with olive oil, is used, both as a preventive and a cure. It is supposed to fill up the pores, and to prevent absorption; but this very quality is one of the chief causes why I suppose it to be prejudicial: for the exhalent vessels having been greatly excited by caloric, if the absorbent vessels are not equally excited, the consequence will be an extravasation of serum under the cuticle, which will appear as bladders or blisters. Instead, therefore, of any application which prevents absorption, every such substance should be cautiously avoided, as having a pernicious tendency. I have no hesitation



then in asserting, both from theory and extensive practice, that oils used in the first periods of accidents of this nature, are the worst applications we could have recourse to. The result of the first and second mode of treatment fully warrants me in this assertion.

*Opium, dissolved in Oil.*—I have heard this application much extolled by many practitioners, and I have frequently used it myself; but I must confess, I never observed any difference, in the effects, between simple oil, and oil with opium. If the preceding theory of the action of oil in stopping the pores of the skin, and preventing absorption, be just, the inefficacy of this application will be fairly accounted for. There is a considerable difference between the mere application of oil and opium upon an irritated surface, and opiate frictions. In the former case, it is not likely the absorbents will take up the application; but in the latter, a certain proportion may mechanically be forced through the pores of the cuticle, and come into contact with the cutaneous absorbents. On this principle the efficacy of opiate friction, in some spasmodic affections, may be explained.

*Carron Oil.*—Lime water, mixed with an equal quantity of linseed oil, forms a convenient saponaceous liniment, which is much used for burns at the iron founderies of Carron, in Scotland. Hence arises its name of Carron oil, by which it is designated and known in many parts of the country. It is an application held in much esteem in many provincial hospitals in England, The great repute this application possesses, arises, I apprehend, from its being contrasted with the efficacy, or rather inefficacy, of common oil.

That it is superior to any of the oils *per se*, I readily admit, and that there are stages in the treatment of such accidents where it may be useful ; but as a first application, and one proper for the whole treatment, I certainly deny. It is of a better consistence than oil alone, and does not relax the vessels of the surface in so great a degree ; consequently, the profuse secretion of pus is in some measure lessened.

*Goulard's Cerate.*—This is an application very much extolled by the inventor, in cases of injuries from burns or scalds. Its composition is as follows : Four ounces of bees' wax, dissolved in a pint of olive oil, which mixture, as it cools, is to be beaten up with a wooden spoon ; during the operation the following are to be added gradually : a quart of distilled water, and four ounces of extract of lead ; these incorpoate with the wax and oil, and form an elegant and useful application, in a variety of affections of the skin. But as applications of lead are supposed to lessen the nervous power, and the cold water, united with it, will tend to lessen the action of the part, it is a very improper remedy to confide in at the first periods of such accidents. In young subjects, where the injured surface is extensive, it sometimes produces unpleasant effects upon the whole system, by being absorbed. When eschars are thrown off, in older subjects, it is also a dangerous application, as the mouths of the absorbents are more exposed to take up the poison.

*Fluor Volatile Alkali.*—When I was at Paris, in the year 1788, I attended the lectures of Mons. LE SAGE, at the Hotel de la Monnoie. He recommended the use of the fluor volatile alcali, in cases of burns. The manner in which he



recommended its application was thus : to apply cloths moistened with it to the burnt part, which were to be renewed as often as dry, or until the pain had ceased. This mode of treatment might answer very well for any slight burn or scald, which M. LE SAGE accidentally received in his chemical experiments ; but to more extensive injuries, where disorganization had taken place, a series of different applications would be necessary. From the account of Monsieur LE SAGE's cures by this remedy, we are induced to conclude that it had only been used in trifling cases. In this point of view it may be ranked with other empirical applications, as recommended by HEISTER and others. I have heard Mons. FOURCROY, at the Lyceum in Paris, recommend it in his lectures. He supposed it might unite with some loose particles of caloric, and carry them off before they could combine with the animal fibre, and cause disorganization of the part. If the above was the fact, it could only act upon the loose uncombined caloric ; for, if the part had been already disorganized, it could not be restored by such means ; in that case, different processes of the system must have followed, in order to effect the cure. I am therefore authorized in concluding, that severe and extensive injuries from fire have not been subjected to the curative process, by means of the fluor volatile alkali alone.

*Vitriolic Æther.*—If the above explanation of the use of the fluor volatile alkali had been just, it would speak strongly in favour of the application of æther. The readiness with which æther assumes the gaseous state, would point it out as the best uniting medium for any disengaged

caloric on the surface. The following experiment will shew this effect more clearly.

EXPERIMENT.—A small sensitive thermometer, indicating 62 degrees, the temperature of the room at the time of the experiment, had its ball dipped into a tea-cup full of æther, and withdrawn; then a current of air from the nozzle of a pair of bellows was directed to it, which produced a great evaporation of the æther, and a sudden depression of the mercury in the tube. By frequently dipping the ball into the æther, and then proceeding with the blast from the bellows, the mercury fell to 8 degrees, being 24 degrees below the freezing point; thus causing the mercury to sink 52 degrees, by the experiment.

Suppose a person to have boiling water applied to any part of his surface, and that æther is immediately afterwards applied, he would thus be tossed from Scylla on Charybdis; and, to avoid being boiled, he would be frozen to death. I have tried the application of æther upon rags of cloth, in the manner the fluor volatile alcali was applied; but as it produced a shivering, which, in accidents of this kind, I have always found indicative of much constitutional distress, I desisted from its use. The external application of æther I have found from *experience*, in such accidents, to be pernicious; and, from the theory I have given, its use is ridiculous. But the effect of æther would be different was the part to be covered with a plaster, so as to prevent evaporation; we might then secure its stimulant operation upon the surface. With such precautions it might be useful, though there are other remedies far preferable.



ALCOHOL.—The evaporation of alcohol is very different from that of æther.

*Experiment.* The same thermometer, indicating 62 degrees, was plunged into alcohol; then a current of air from the bellows thrown upon it, and repeated until it ceased to fall; when it indicated 42 degrees, making the depression 20 degrees, whilst that of æther was 52 degrees; thus making a difference of 32 degrees in favour of the evaporating effect of æther. The danger produced by the chilling effects of evaporation will therefore be much less in the use of alcohol, than of æther. All fermented liquors owe their relative strength to the proportion of alcohol which they contain. By the distillation of any fermented liquor, the alcohol, being more volatile than the other principles, is first carried over and forms ardent spirit, which by rectification produces spirit of wine, or what the Arabian chemists termed alcohol, a name still retained in the new chemical nomenclature. Many substances have been recommended for burns, such as brandy, geneva, rum, &c. &c. all of which have contained more or less of alcohol: their relative value-I believe to have consisted in the more or less alcohol which they contained.

From many experiments, I am induced to believe that pure alcohol is the best of these applications. This fact did not escape the observation of that attentive and honourable recorder of medical truths, Sydenham. He strongly recommends it in all cases of inflammation, which are capable of being cured by resolution. I have seen very good effects from the use of alcohol, by washing the burned parts with it, and afterwards covering them with yellow basilicon

brought to the consistence of a soft ointment with essential oil of turpentine. A very good application, which is generally at hand in most families, is lavender-water: it is composed of alcohol and some essential oils. As it is generally in the houses of the opulent, I have found it a ready and useful application in cases of scalds, both in the drawing-room and in the nursery; it is to be followed by the use of the same ointment before recommended.

**ESSENTIAL OIL OF TURPENTINE.**—This is obtained by the distillation of common turpentine: it is generally regarded as an essential oil, though it is for the most part immiscible with the alcohol of the shops. Chaptal says, pure alcohol combines with it. It was a remedy seldom used internally; in small doses it has produced the most violent effects upon the urinary organs; but latterly it has been employed in large doses, for the expulsion of the *tenia lata*, or tape-worm. Three ounces of pure spirit of turpentine has been taken at one dose, and a similar dose repeated at the expiration of two hours, which expelled a tape-worm and proved a certain cure. No bad consequences arose from this great dose; smaller doses have also proved efficient. The evaporation of the essence of turpentine is considerably less than that of the two preceding articles.

*Experiment.*—The thermometer at 62 degrees was immersed into essence of turpentine and exposed to a current of air, as in the preceding experiments. It could not be depressed below 52 degrees, making a difference of 10 degrees between alcohol, and of 42 degrees between turpentine and æther.



As evaporation or cold to the surface always does harm in the accidents I am treating of, essence of turpentine will be the most eligible, as producing that in the smallest degree. When applied externally, it powerfully excites the absorbents of the part. I have always found the urine of the patients, who have been thus treated, strongly impregnated with the peculiar violet odour which a small dose of that substance gives to the urine, when taken internally. Many other substances may possess similar powers, but as they are not so obvious to our senses, they can only be supposed by analogy. It has been already remarked, that one of the principal effects of caloric applied to any part is to increase the action of the exhalent vessels, and cause an afflux of their contents to the surface, which if not counteracted by an equal excitement of the absorbent or recurrent vessels, an extravasation would be the consequence. This effect is produced, as we see, by the formation of blisters or vesicles. If therefore any substance has the power of exciting the absorbents equal to the action of the exhalents, an equilibrium of action will be produced, and the part restored to a state of health. I have seen many cases where vesicles had been formed, which, by the application of essence of turpentine and the basilicon, as recommended, have been re-absorbed, and the cure has been performed by what I should call the first intention. From the stimulant effect of some of the preceding applications, when applied to the surface of the body in its ordinary state of action, the plan I have recommended has been denominated the stimulant plan of treatment. But if we compare the stimulus of

disengaged caloric upon the surface of the body, even essence of turpentine at 200 degrees of temperature will rank as a sedative relatively. In such cases, heated essence of turpentine will rank in the class *torpentia*, or amongst those applications which lessen action.

Having given a short comparative view of the efficacy, or rather inefficacy of some of the applications formerly used, and which even at present hold a considerable degree of reputation at several hospitals in this country as well as in different parts of the world; and also having pointed out some substances which from extensive experience and careful estimation I have found of infinitely superior power in such cases, I shall now proceed to give an account of the method I recommend, according to the division which has been already pointed out.

*First.* Of those cases where the action of a part is only increased. To render the description more clear, it will be better to divide the treatment into two parts, namely, the external and the internal.

#### THE EXTERNAL TREATMENT.

When the system is exposed to a certain degree of caloric, all its functions are well performed. If the heat applied to any part be gradually increased, the action of that part will likewise be increased, which, if in a small degree and it should be long continued, the effects upon the system would be various according to its continuance. It is not this effect however that we are to describe; it is the sudden application of a quantity of combined or uncombined caloric to some part of the body,



which excites in that part a violent increased action. This effect is sometimes produced by the combustion of carburetted hydrogen gas in mines, or by the explosions of gunpowder; at other times by heated or boiling fluids, such as water, oil, &c. or from heated solid metallic or stony bodies. The extent of the injury arising from any of these causes may be judged of from the appearance of the parts injured, except in some instances of the miners, where the cuticle is so covered with fine coal-dust as to render the subject nearly black. In this case the feelings of the unhappy sufferer will enable him to point out the extent of his injury. At all events it is better to be too lavish than too sparing. The remedy will not injure sound parts; it will therefore be erring on the safe side to be profuse. The subsequent dressing will sufficiently inform you whether you have been too profuse or too negligent. The excruciating pain arising from accidents of this class will insure your assistance being called for at the earliest period. If vesications are forming or have been formed, it will not be necessary to waste your time by attending to this symptom, such as a too minute attention in puncturing or snipping them with the points of scissors. If the cuticle be lacerated so as to expose the skin, it need not make any difference in the treatment. The pain of an injury which has detached the cuticle by the continued application of heat, will not have the pain increased even by the application of heated essence of turpentine: on the contrary, it acts as a sedative, and in many instances produces sleep, particularly in cases of infants. In such cases the

mind, or prejudices, can have no effect: Nature, in these subjects speaks, as she feels.

Take a tea-cup, or any convenient vessel, into which put some essence of turpentine; place it in a basin of hot water, so as to communicate such a degree of heat as you can well bear with your finger. I prefer essence of turpentine, for reasons already assigned; but if it is not at hand, alcohol may be substituted, or any substance of which alcohol forms a constituent part, as for instance, spirit of wine with camphor, lavender-water, brandy, rum, or geneva, &c. The fluor volatile alkali, the aromatic spirit of ammonia or hartshorn, or any of these substances, when thus heated, should be applied over the injured parts by means of a rag dipped into the liquid, or a probe armed with lint and used as a brush. When this has been plentifully done, the injured parts are to be covered with plasters formed in the following manner.

Take of common yellow basilicon according to the occasion; let it be rubbed upon a marble slab with as much of the essence of turpentine as will bring it to the consistence of a soft ointment. In the former edition I said to the consistence of a liniment; in consequence of which the College of Physicians, in their Pharmacopœia, 1809, have given a formula for a turpentine-liniment, which Doctor Powell in his translation informs us was adopted from my recommendation of it in burns. I am sorry the inaccuracy of my language should have led to misconception. The liniment of the College is too thick to be applied as a wash, and too thin to be applied as an ointment. I therefore prefer the use of the ointment as above, and the essence of turpentine alone as a wash, in the



first instance. The plasters should be applied as soon after the wash as possible, to prevent the pernicious chilling effects of evaporation.

Parey, Hildanus, and most of the older surgeons, lay great stress upon the frequent repetition of the applications to burns. If cold lotions were applied, such advice might be necessary, even as frequently as Hildanus recommends, namely, every quarter of an hour. But, from the principles which govern my practice, it will be seen that cold to the surface in the first stage of the injury is to be carefully avoided. If the burnt parts are well washed with heated essence of turpentine, and then covered with a plaster spread thickly with the ointment recommended, it will not be necessary to expose or examine the injured parts in less than twenty-four hours after the first dressing. When the injured parts are again to be examined, it will be necessary to have fresh plasters ready spread, previous to exposing the injured surface: only one plaster should be taken off at a time, and that immediately replaced. In some instances it may be necessary to repeat the wash with heated essence of turpentine on the second day, but in general a wash with some heated tincture of opium will be preferable. By proceeding in this manner, the rigors which frequently occur when evaporation is permitted to take place from a large heated and exposed surface, will be avoided. This attention is of great importance, for, if we avoid the torpor, we shall also avoid the febrile re-action, this will greatly add to the safety of our patient. At the third dressing, twenty-four hours are supposed to have intervened between each, the appearances will have much changed.

Many inflamed parts will have disappeared, being cured, if I may be permitted so to express myself, by the first intention; others, which were more injured and had slight vesications produced at the first, will now have such a secretion of pus as we frequently observe on the second day after the application of a blister. In superficial burns, having about the third or fourth day produced the above effects, it will be necessary to change the mode of treatment. For if the same means were continued, they would cease to be curative; nay further, they would be pernicious, and excite an inflammation upon the skin which would be more unpleasant and difficult to cure than the original accident. The heated essence of turpentine, which, when first applied, in comparison with the caloric was a sedative, would now assume a different character, and become a strong stimulant. Milder applications should next be used: *ceratum lapidis calaminaris*, or Goulard's cerate, are good in this stage of the injury. If unpleasant irritation should have been excited by the use of the remedies recommended, a cataplasm with linseed-flour and hot water, or hot water on the crumbs of bread, for twenty-four hours, will in general remove all irritation. These emollient cataplasms should not be continued longer than a day or two, so as to overcome the irritation; for, if longer continued, they relax the surface of the sores, and cause a profuse secretion of pus, which it is difficult to restrain. An ointment made by adding a scruple of calcined zinc to an ounce of *unguentum ceræ albæ*, I have found an excellent application, under which sores of this nature heal rapidly. The new cuticle upon such sores is exceedingly tender, and



requires much care and management to prevent abrasion: keeping it from the action of the air, and supporting it by applying slips of adhesive plaster, is attended with the best effect. When such attention is not given, the cicatrices are liable to become thickened and corded, and remain most unsightly scars. This is most frequently observed when the accident has happened upon the neck: the skin upon the platysma myoides muscle is liable to become thickened; and sometimes the chin is attached to the breast, the integuments from the one to the other forming a kind of apron, spreading from the chin to the upper part of the breast-bone. I trust I have clearly pointed out my method of the external treatment of increased action produced by the excitement of caloric; I shall therefore proceed to point out the internal treatment of such injuries.

THE INTERNAL TREATMENT OF INJURIES PRODUCED  
BY CALORIC, WHERE THE ACTION OF THE PARTS  
IS ALONE INCREASED.

The temperature of the human body is in general about 98 degrees; but, to facilitate my explanation, we may suppose it at 100. The whole body being in perfect unison acting at the rate of 100, an instantaneous application of boiling water, at 212, is made to some part of the body; that part will be immediately excited to an increased action, which I shall suppose to be indicated by 150. In this state there will be a disparity of action between the part and the whole,

equal to 50 degrees. As I have already mentioned, the cure must consist in restoring a unity of action between the part and the remainder; if therefore I am enabled to excite the action of the general system up to 125, the disparity of action will be immediately diminished by 25. The indications in this case will therefore be to excite in the most sudden and rapid manner, the greatest possible action of the general system, compatible with life. A large dose of hot spirit and water, either brandy, rum, or gin, with sixty or a hundred drops of tincture of opium, and a tea-spoonful of sal volatile or æther, should be exhibited. Placing the patient between blankets in a hot bed is desirable; if the shivering should be considerable, bottles of hot water should be applied to the soles of the feet and to the pit of the stomach. The first few hours in the treatment of such accidents, is of the greatest importance. As in cases of frost-bitten limbs, if the system in general be too suddenly excited into action, the frost-bitten parts drop off, and preclude all possibility of cure; so in cases of increased local action from burns, the excited part must not be allowed too suddenly to have the excitement withdrawn, but be allowed gradually to lower its action, from the ideal 150 to the 125. Thus, by stimulating the general system, and lowering the excessive action of the part, the restoration of the equilibrium of action in the whole, or in other words, the cure, will be facilitated. When the system has, according to this plan, been stimulated to its greatest safe extent during twenty-four hours, the excitement should be lessened. On the following day, negus, with an occasional opiate if the pain continues, should be administered. As secretion



frequently appears on the third day, the necessity for stimulants will cease, and they must give way for a different mode. Saline purgative medicines should be given after secretion takes place, both with a view of tranquillizing the system under the inordinate action excited by the stimulants, and to lessen the secretion of pus. The internal treatment, as well as the external, is only to be continued during a certain time; for, though proper in the first instance, they are both pernicious if too long continued. By attention to these principles, I have seen extensive burns and scalds cured in six or seven days, which I can affirm by the old emollient method would have required more than as many weeks. I have also seen the same benefits from these principles, in the practice of others as in my own, and have had various communications from distant correspondents, who have tried them to the same effect. The treatment from increased action being thus pointed out, I shall now proceed to the second division, viz.

SECONDLY. OF THOSE CASES WHERE SOME PARTS HAVE THEIR ACTION INCREASED, AND WHERE OTHER PARTS HAVE THEIR ACTION AND ORGANIZATION DESTROYED.

I shall follow the same order in treating this portion of my essay, as I did in the former; by dividing the subject into the external, and internal treatment.

## I.—THE EXTERNAL TREATMENT.

As I never met with an instance where a part was disorganized, but that other parts would come under the definition of merely increased action, the indication of treatment should be the same as already given in the former part. It is of no consequence what we apply to the disorganized or dead parts: our duty is to restore the diseased living parts to a healthy action. The throwing off eschars formed by a burn depends upon the vital actions of the general system, which will neither be retarded nor facilitated by any thing which is applied to the dead parts. The progress of those parts, which have only been slightly injured, will enable us to form a judgment of the manner in which those parts proceed that have been destroyed; for, if the curative indications proceed with celerity in the one, we may rest assured they are progressive in the other. When slightly injured parts begin to secrete pus, which sometimes commences on the third day, other more injured parts, where eschars are formed, will commence the suppurative process. There is no circulation in the eschar; hence obstruction, which causes tumefaction; then redness, heat, and inflammation: if the process goes on kindly, the absorbents detach the dead from the living parts, whilst the exhalents secrete pus; thus the surface of the body is again restored to its original state, that of an absorbing and secreting surface. When a part of the integuments are thrown off by an eschar, the exposed surface continues to secrete and absorb. The quickness, or slowness of healing a wound, in a great measure depends upon the nice balance of these



secretions. If nature is not assisted and well-supported until secretion takes place, we have seen the evil consequences which would follow, as marked out by the cases of JOHN THOMPSON and JOHN CLARK. The benefit arising from this mode is clearly shewn in the case of THOMAS JOHNSON, who certainly owed his life to the practice, although it will be seen hereafter, that the cure was retarded by the too long continuance of the means which in the first instance saved him. The suppurative stage in the most favourable cases begins about the third day, and in the most unfavourable that I have seen, it has not been protracted later than the tenth; the danger of the accident may be judged of from the commencement of this process. If it should not have taken place by the tenth day, the irritative fever caused by the pain, followed by the ineffectual efforts of the suppurative fever, not being able to produce the separation of parts, the system would be exhausted by excessive action, the parts adjoining the injured would die, and assimilate the rest of the system by the same process. It was a practice much recommended by old authors, to make long and deep incisions through the eschars formed by burns: some recommended it to prevent deeply seated suppuration; others to hasten the sloughing process. The former, I believe, never takes place on such occasions, and the latter does not require this cruel assistance. The inflammation around the edges of an eschar, when going on well, terminates by dividing the skin; when the skin is separated, the other parts implicated in the eschar will follow according to their specific nature. If only the adipose and cellular membrane be affected, they will speedily be detached,

and leave the wound in a situation to granulate and heal. When tendinous fibres are included in the eschar, many months may elapse before the whole is separated, as was the case with THOMAS JOHNSON. During the process of sloughing, if the eschar is in a convenient part, a cataplasm with hot water and crumbs of bread, or linseed-flour, is, from its softness and ready adaptation to the wound, as well as from giving a grateful degree of heat, one of the best applications during the early period of separation. If too great a secretion of pus should ensue from the use of the cataplasm, it may be lessened by making the cataplasm with aqua lythargyri acetati composita; or by adding a little sulphas aluminis to the water with which the cataplasm is made, the strength of the solution might be gradually increased so as to produce the effect desired. The alum is better than the solution of lead, particularly if the wound be at all deep, as the mouths of the absorbents in that case might take up so much of the lead as to produce colic. As an absorbent, finely prepared chalk is very useful; it is rendered better by adding one fifth part of powdered starch. This composition may be laid, previously warmed, on the surface of the wound, particularly close to the sloughing eschar, to the thickness of a quarter of an inch; over which the cataplasm may be applied; or dry lint, upon which a plaster spread with wax and oil. The parts of the eschar which are not detached so as to be cut off by scissars, may be washed with tincture of myrrh, to prevent unpleasant effluvia. When the whole of the eschar is detached, the wound must be dressed in such a manner as to



keep the secretion and the absorption equally balanced. I have found sores of this description heal rapidly under the application of chalk and dry lint. The oculus eruditus of an experienced surgeon will point out to him when the sore requires exciting, or soothing; and he alone will be enabled to appreciate the superiority of this mode of treatment, by comparing it with what he had observed before.

## II.—THE INTERNAL TREATMENT.

It will be observed, from what I have already stated, that I never saw so complete a destruction of a part, but that some other parts were excited to a mere increased action. Now this being the fact, it will be natural to conclude, that the method of treatment I followed in cases of increased action should be had recourse to in these, until the morbidly excited parts should be restored to a unity of action with the general system. This mode being sufficiently detailed, when describing the internal treatment of injuries produced by caloric, where the action of the parts is alone increased, I shall not again repeat that treatment, but refer to it, to shew the intention with which the practice is recommended. When the practice pointed out has been pursued, so as to rejoin the general system to those parts with increased action, a change must take place in the treatment. But where there are considerable eschars, lowering the actions of the system must not be so rapid as where there were only increased actions; for the process of detaching

dead parts from the living requires the energies of the constitution to be supported. In this case, when the unity of action is restored, the strength should be kept up by nourishing diet, until the eschars be detached; but those stimulants which increase action should be discontinued, such as spirit, wine, ale, &c. Cinchona is supposed to give strength; it may therefore be given in this stage of the complaint: if it be given in milk, it will supply a bland food, with tonic medicinal effects.

It will be necessary to continue the use of anodynes for some time; when the case is severe, I have found it necessary to give them night and morning, particularly if the wounds required much dressing. The anodyne should be taken about an hour previous to the visit. The constipating effect of opium in this stage, is best counteracted by small daily doses of saline purgatives. If the secretion of pus should continue profuse when the eschars are detached, a counter irritation upon the mucous membrane of the intestines will be necessary. A brisk cathartic, with calomel and jalap, according to the strength of the subject, given once or twice a week, will astonishingly facilitate the cure.

As I have now detailed the principles upon which my practice is founded, and given such a general outline of the mode of treatment in all the different stages as will enable a practitioner to apply them; I shall proceed to illustrate the principles further, by relating some cases which I treated according to the mode I have recommended to others.



## CASE.

JAMES JACKSON, aged thirty-six, a miner at Benwell colliery in the neighbourhood of Newcastle-upon-Tyne, in the month of November, 1792, was exposed to the action of disengaged caloric, from the combustion of a large quantity of carburetted hydrogen, which, from the neglect of keeping up a free circulation of atmospheric air, had collected in a part of the mine, where he had occasion to pass with a lighted candle; this acted as a combining medium between the oxygen and carburetted hydrogen, which produced an explosion. He had on a flannel shirt, drawers, shoes, and stockings; so that the parts exposed to the contact of the flame were his face, his neck, and part of his breast, also his hands, and some parts of his arms. From the whole of the face being much burnt, particularly the lips and the nostrils, there was as much reason to suppose this man had inhaled the flame and was burnt internally, as in any case that I had ever met with. The hands in many places appeared deeply burnt; he had severe shiverings; and all the symptoms which I have before observed indicated a violent shock to the general system. The whole of the burnt parts were liberally washed with heated essence of turpentine, and covered with plasters thickly spread with basilicon made very soft by essence of turpentine; a cordial draught containing fifty drops of laudanum was instantly given; of a pint of oily emulsion, with an ounce of camphorated tincture of opium, a tea-cup full was exhibited every three hours; also a bolus

at night with two grains of opium. The diet was ordered to be generous, and strong negus for his drink.

*Second day.*—He had suffered several paroxysms of pain during the night, with short intervals of repose. Slight vesications appeared in different parts of the neck and face; the serum from these was discharged by puncturing them with the sharp point of a probe. It was not thought necessary to repeat the washing of the parts with essence of turpentine, but to use something less stimulating: tincture of opium was thought of, and applied; afterwards the plasters as on the first day; a pint of the decoction of cinchona with two ounces of compound tincture of bark was ordered to be taken, in the quantity of a tea-cup full, every two hours; the opiate bolus was repeated, with the addition of five grains of calomel, to obviate constipation; the diet continued.

*Third day.*—Had more sleep last night, and less pain than the night before; the redness of the neck and breast a good deal disappeared: where the vesications had been, a kind of secretion took place, such as may be observed the second or third day after the application of a blister; some of the redness had also disappeared about the wrists; but the hands remained much in the same state as they were in at first; the general redness of the parts was diminished. To the parts which were secreting purulent matter only the plasters as before were applied: those parts of the hands which were not changed were again washed with the tincture of opium, and then the plasters as before; the same medicines were continued except the calomel, which had procured an evaporation.



*Fourth day.*—He had not passed so easy a night as before; pulse 110; tongue dry and complains of thirst. The parts which had been red and irritated by the burn, and by the applications made to them, had on the second and third day ceased to wear that appearance; they again began to re-assume their redness; the secretion from the vesications on those parts had also ceased. From these circumstances I apprehended that the stimulating applications to the external absorbents, after they had taken up the effused fluid, had caused this effect; for although secretion took place in some, yet the effused fluid from many vesications was perfectly absorbed. I therefore discontinued the application of the basilicon with essence of turpentine, and applied the cerate with lapis calaminaris to the face, neck, and breast. The hands were tumefied, but as there had been no secretion upon them, and as in places they were much burnt, I considered this an effort of the system to throw off the eschars, and therefore continued the turpentine application.

*Fifth day.*—He passed an easier night; pulse 100; the re-inflammation upon the face, neck, and breast had much abated, and there was a little moisture upon those parts which before had secreted; the unirritating dressings were again applied; the hands were still tumefied, to which the turpentine ointment was continued. Medicines as before.

*Sixth day.*—He continued easier; the face, neck, and breast much better; new skin had been formed in some parts; the hands were tumefied, but the skin round the edges had begun to separate and to secrete pus. Continued the same means.

*Seventh day.*—The upper parts were skinning fast; secretion was considerably increased upon the hands.

*Eighth day.*—Skin forming rapidly on the slightly injured parts; the hands had secreted much pus, and the eschars were loosening. The excitement of the system, both by the internal and external means used, having brought the surface to a plentiful state of secretion, I was induced, from my former experience, to desist urging the system to continue the same increased action: the tincture of bark was therefore omitted, and the anodyne lessened; negus and ale were prohibited; the hands were dressed with the cerate of lapis caliminaris.

From the eighth to the fifteenth day, the same means were used with the best effect; the change of diet moderated the discharge to so great a degree, as to induce a more rapid disposition for healing than I had ever before observed. On former occasions, notwithstanding the use of every topical astringent that could well be thought of, the quantity of pus secreted used to be enormous; and the length of time such secretion continued, brought on such a state of surface, as resisted and baffled every effort of art to overcome it. The means used with the intention of preventing the patient sinking under the increased secretion, was the principal if not the sole cause of the continuance of that morbid state of surface. The face, neck, and breast were now perfectly skinned. To avoid the cracking of the tender cicatrices, they were anointed with a little camphorated oil two or three times a day: it appeared also to lessen the unpleasant redness which is generally attendant upon injuries of this kind. The sloughs



upon the hands came away kindly; three of the nails of the left hand were thrown off, and the ulcers healing at the edges.

From the fifteenth to the thirtieth day, the progress was constant and rapid; the ulcers cleansed, granulated, and healed kindly; the fungus which appeared was tractable by the nitrate of silver; the whole at length became covered with cuticle, but which remained very tender for some time; the flexor and extensor tendons of the fingers remained stiff and contracted for want of motion, but by the use of the camphorated oil and frequent motion of the hand, they were in a short time restored to their accustomed action.

This is the first case I had treated according to the new principles laid down; and, when I compare the result with what I had observed on former occasions, I had great reason to be highly satisfied with my exertions. By the first mode of treatment I should probably have lost this patient; by the second he would have required above six months to perform the cure, in comparison with THOMAS JOHNSON'S case; but by this third mode of treatment he was rendered sound and capable of work in about six weeks. This plan combined every thing I had to wish: it saved life, it eased pain, and it speedily restored my patient to health and usefulness. The following case, where the accident was produced by another cause, will shew the universality of the principles.

## CASE.

Mr. GLYNN, aged 20, clerk to a foundery in the environs of Newcastle, on the 23d of June, 1794, trying some experiments on the fluxing of brass, had the misfortune to let the crucible, when at a white heat, fall into the ash pit, which had been previously filled with water to increase the heat of the furnace; this it does by supplying an elastic vapour capable of being decomposed by the fire, and thereby assisting the intensity of the combustion. The instantaneous decomposition of a portion of the water in the ash-pit, from the immersion of the crucible and heated metal, caused such an explosion as to equal in its report the largest piece of ordnance, and almost as terrible in its effects: the windows of the building were blasted out, and the operator thrown with violence to a considerable distance; he received many contusions from the shock: the elastic vapour in a most scalding state, and the boiling metal came in contact with many parts of his body. The face was the most exposed to the vapour: it may be called the *burning* vapour, for the eye-lashes, eye-brows, and a great portion of the hair of the head, were quite consumed; the integuments of the eyes and the immediate conjunctive coats of the eyes were so severely affected, as to make me apprehend the loss of these organs, but more especially the left, which had suffered the most; the neck and that part of the breast only covered with the shirt were much injured by the scalding vapour. The legs and feet appeared most injured by the melted metal. He had only trowsers on the lower limbs: the heated metal had perfo-



rated through this covering, and in many places had formed large circumscribed ash-coloured eschars; in other parts metallic scales had adhered to the limbs, which were afterwards detached by the point of the probe, having previously formed so many cauterised patches. He was fortunately seen within a quarter of an hour after the accident: his situation and appearance was most dreadful, and renders it almost impossible to give a description of his sufferings. Blind, stamping, raging, frantic with pain, all his intreaties were to give him instant death; shivering as if in an ague-fit, yet dying from the torments of a burning heat over the whole of the injured parts. Never had I seen a human being in such exquisite torture. The essence of turpentine was liberally applied to every injured part except the eyes; which was prevented by the swelling of the integuments, for they were perfectly closed; the parts were then covered with the basilicon ointment made soft by the essence of turpentine. A large opiate in a cordial draught was instantly given; a cordial mixture with a large proportion of compound tincture of opium was ordered, a dose of which was to be given every hour until easier; after the dressing he was put to bed. The accident happened about four o'clock in the afternoon, and when I saw him about nine in the evening, I found the pain had gradually abated, so as to be supportable in about three hours after I left him; his mind was in great agitation, as he believed he had lost his sight. I endeavoured to pacify him, and gave him another large dose of tincture of opium, with orders to continue the anodyne mixture during the night, and to drink plentifully of strong negus, if thirsty.

*Second day.*—Pulse 120; he had severe paroxysms of pain during the night, but during intervals had some disturbed slumbers; the injured parts at this dressing appeared much as they did at the first, except that some slight vesications had formed about the face, neck and breast; the eyes were perfectly closed up by the swelling of the eye-lids; tincture of opium and camphorated spirit of wine in equal proportions were used to wash the parts with; the same dressings repeated as at first; two ounces of decoction of bark with ten grains of aromatic confection were ordered to be given every three hours; the anodyne with thirty drops of tincture of opium at night; the negus to drink, and any food his stomach should feel an inclination to take.

*Third day.*—Pulse 120; he had been easier than the day before; more vesications had arisen; in other respects appearances much as they were yesterday; the same medicines and diet continued.

*Fourth day.*—He had been much in the same state as during the preceding twenty-four hours; some appearance of secretion on the vesicated parts, to these parts the ointment with essence of turpentine was changed for the cerate with lapis calaminaris; to the other parts the opium and camphor wash, with the same ointment, continued; medicines and diet as before.

*Fifth day.*—Remained tolerably free from pain; a good deal more pus had been secreted on the face, and a purulent discharge from the angles of the eyes; he thought he perceived a light when a candle was placed near the right eye. This circumstance produced the most pleasing feelings in his mind, which had pre-



viously been much agitated by the fear of losing his sight; the inflammatory action commenced around the eschars on the lower limbs, caused by the heated metal; a redness and tumefaction attended with pain, were apparent; the same wash gave relief, and the same ointment was continued to these parts; the same medicines; also five grains of calomel were given at night, diet as before.

*Sixth day.*—The calomel had procured an evacuation; a considerable discharge of pus from the neck and face, but more particularly from the eyes; the swelling having much subsided, permitted the eyes to be examined; there was much inflammation on the whole tunica conjunctiva; a little of the following excellent cooling ointment was applied with a camel-hair pencil to the coats of the eye: twenty drops of aqua lithargyri acetati, an ounce of rose-water, beat up by means of a wooden spoon with an ounce of unguentum ceræ albæ; these were melted together in a small basin. Some of the eschars were beginning to separate, and secrete pus around their edges. The exciting means having so quickly and happily brought him to this stage, I then changed the plan, according to the principles laid down in this essay. The eschars detaching themselves exposed a very sensible line of granulation, which no longer required the stimulating wash, as it was secreting plentifully, both the wash and the turpentine-ointment were desisted from; the cerate with lapis calaminaris was applied to the wounds; the diet was changed, the negus omitted, and only a little boiled meat allowed once a day; the cinchona was given without cordial confection; and the opiate at night continued.

From the *sixth* to the *twelfth day*, the progress of convalescence was most rapid: the face, neck, and breast had quite a new skin formed; the eyes continued weak, and discharged much purulent matter; they were also much inflamed; blood was let from the arm, and a collyrium with sulphate of zinc and rose-water was ordered to wash the eyes with; the ulcers on the legs cleansing, the diet was ordered to be more spare; toast and water for common drink; the anodyne omitted.

*Sixteenth day.*—The eyes were much benefited by the bleeding and spare diet; they were still inflamed and vision imperfect, but they gradually got better; the new cuticle of the face, neck and breast was anointed with camphorated oil, to prevent its cracking; the wounds on the lower limbs going on well, the eschars detached themselves; granulations forming and skinning commenced around the edges.

From this period to the *thirtieth day*, his progress was regular, when his cure was complete: he had continued the low diet, and had occasionally taken a brisk cathartic; the eyes remained tender; he was advised to go into the country to his relatives, and he returned in a fortnight perfectly well.

The happy and speedy termination of this most extensive injury, I impute in a great measure to the fortunate circumstance of being so situated as to be enabled to have *immediate* assistance. A few hours lost in this case would have caused such irritative fever, as most probably might have exhausted my patient. The benefit of bleeding and purging, with abstinence in the *latter* stage of the treatment, is clearly shewn in this case. The principles laid down



in the essay were all followed in the treatment, and the result was highly satisfactory: life was saved, pain was lessened, and the period of cure was shortened by months. I shall now proceed to relate a case of a very severe scald.

### CASE.

THOMAS SMITH, aged 45, a workman at a flour-mill in Newcastle-upon-Tyne, which was worked by a steam-engine, having something to do about the boiler, missed his hold and fell in; he fortunately caught hold of some of the machinery, which prevented his total immersion, and only the legs up to the knees were exposed to the boiling water. When I first saw him, his situation was most distressing: in taking off his stockings, the cuticle, which had been totally detached by the boiling water, was torn down from the knees, hanging in ribbons over his ancles and feet. He was dancing about the room from extreme torture; and when he stood still to speak, his teeth chattered in his head. The legs were immediately washed with alcohol, over which was applied plasters spread thick with basilicon and essence of turpentine; a cordial draught with sixty drops of tincture of opium was immediately given; he was ordered a cordial mixture with compound tincture of opium, a dose of which was to be taken every two hours during the extreme pain; strong negus for his drink, and to eat any thing he wished.

*Second day.*—The pain gradually abated, after he was dressed and put to bed, during the space of about three hours, when it remained

some time stationary ; paroxysms of increased pain occurred during the night, but each succeeding paroxysm was less violent and of shorter duration than the former. Some vesications formed about the ancles and feet ; the other parts not much changed in appearance, except that a considerable swelling has arisen upon one of the shins : this I apprehend was caused by a contusion at the time of the accident, though he was totally unconscious of any thing of the kind. The parts were washed with camphorated spirit and tincture of opium in equal portions, and the same ointment continued ; the cordial mixture and anodyne were repeated, and the same generous diet was continued.

*Third day.*—He passed a tolerable easy night ; there was some appearance of purulent secretion upon the vesicated surface ; the spirituous wash and the turpentine-ointment were discontinued, and the cerate with lapis calaminaris used instead. The bruised part was so much destroyed as to form an eschar ; a bread-and-milk cataplasm, sprinkled with essence of turpentine on the surface, was applied to hasten the process of throwing it off. The cordial anodyne mixture, and the anodyne at night, were desisted from ; the negus was omitted, and a more spare diet ordered ; the bowels being confined, a bolus with five grains of calomel was given at night.

*Fourth, fifth, and sixth days.*—He continued to recover rapidly : all symptoms during this period were favourable ; pus was secreted, and the process of skinning going on well on both legs, except the part where the eschar had formed, which by the use of the cataplasm had



commenced the process of separation, as evinced by a purulent secretion round the edges. Cataplasm continued to the eschar alone, and the other parts dressed with the calamine-cerate. The eschar not having detached itself as yet, he was allowed to have nourishing diet, but nothing stimulating; his constitution being rather weakly, he was ordered to take a dose of cinchona in powder twice a day.

*From the sixth to the sixteenth day.*—Nothing particular took place to retard the progress of the cure, which, with respect to the scald, might then be said to be complete, as the legs were covered with a new cuticle; but the eschar, now nearly sloughed away, had left an ulcer from the loss of substance, which required further time to heal. To guard the new formed cuticle, a liniment of equal parts of linseed-oil and lime-water was applied several times in the day.

It required a fortnight more to heal the ulcer, during which time the linseed-oil and lime-water liniment was used, to guard the new formed cicatrices from cracking and cording; a deformity which injuries of this class are particularly liable to. The cure of so severe a scald in so short a period of time was what I had never before observed in any hospital either in England or on the Continent.

I shall now relate the case of a pupil of mine, which was treated according to the principles laid down in this essay; as there was a great similarity in the accident to one which happened to the illustrious Boerhaave, and which is related in the former part of the essay, p. 20, I wish to draw the attention of the reader to the great difference of the treatment as well as of the result.

## CASE.

Mr. HOPPER, distilling some rose-water on the 4th of August 1795, in a portable tin still, having filled it too full with rose-leaves, the head became choaked up, which prevented the distillation. In this state nothing coming over, he urged the fire, which rendered the still similar to Papin's digester; at length the head flew off with considerable violence, and the contents were thrown upon the operator. He received them principally on the anterior part of the thighs, which were only guarded by thin tight linen pantaloons; the extent of surface injured would have taken half a sheet of folio paper to cover it on each thigh; besides the injury of the thighs, the scrotum and penis were scalded; there were also large scalded patches upon the wrists. In taking off his cloaths, different parts of the cuticle were torn, and several vesications had taken place. The whole of the injured parts, notwithstanding the laceration of the cuticle, were profusely washed with essence of turpentine, and plasters thickly spread with basilicon rendered soft with essence of turpentine, were applied to the injured parts; he was immediately put to bed; he had a severe shivering fit; sixty drops of tincture of opium in a bumper of brandy was given; a large bladder three parts filled with hot water was placed between his thighs: this was about eleven o'clock in the forenoon. The pain gradually abated, and in about an hour he was easy: this state of ease was of short duration; it was succeeded by a slight rigor, which was the precursor of another paroxysm of pain, but of considerable less violence



than the preceding. Paroxysms of pain recurred at more distant intervals, but with diminished force, during the course of the day. At night he was tolerably easy; his pulse, which two hours after the accident had been considerably excited by the irritation, at night had fallen much nearer to its natural standard.

*Second day.*—He passed a quiet night, and was free from pain when I saw him, nor had he much uneasiness since the preceding evening. When the parts were examined, the red irritated surface was considerably diminished in extent. I trust, therefore, I may be permitted to use the expression, that a great portion of this injury had been cured by the *first intention*. Equal parts of camphorated spirit and tincture of opium were applied to the injured parts at this dressing, and the same ointment with essence of turpentine as before. He had made a considerable quantity of urine during the night, which was strongly impregnated with the violet-odour peculiar to the internal use of essence of turpentine; so that I have no doubt of its having been absorbed. The cuticle being torn in several places, the mouths of the cutaneous absorbents would be in immediate contact with the turpentine; it might therefore be absorbed; though by some experiments it is doubted whether absorption takes place when the cuticle is whole. Having remarked the same effect in a variety of instances, I am induced to conclude that, under certain circumstances, the essence of turpentine is absorbed by the skin.

*Third day.*—When the parts were dressed this day, some of the spirituous wash came into contact with the sores where the cuticle had been abraded: it caused a degree of pain which

he described similar in kind, though infinitely less in degree, with that he originally felt in the first paroxysms. Those parts which were now so sensitive, were freely washed with the essence of turpentine at the first moments of the accident, not only without producing pain at that time, but evidently with a soothing and sedative effect. There was a degree of moisture under the vesications, which appeared to hold a middle state between serum and pus. The injured surface having been brought to the state of secretion with such unparalleled quickness, the means hitherto pursued were now changed according to the changed state of surface. The following ointment was applied: two drachms of calcined zinc mixed with two ounces of unguentum ceræ albæ.

*Fourth day.*—He passed an easy night and has been free from pain since the last dressing; one of the places where the cuticle was torn off, was thinly covered with laudable pus; the redness from the immediate irritation had nearly disappeared; in those places where the cuticle was detached from the skin, it was cracking, and a new cuticle forming without any appearance of moisture; so equally had absorption been excited by the remedies.

*Fifth day.*—The part, which yesterday was covered with pus, was nearly skinned over; the cuticle of the penis and scrotum cracked, and peeled off in large scales, leaving a perfect skin underneath; a degree of itching in the part was relieved by a continuance of the ointment; an ounce of sulphat of magnesia was given in a basin of broth.

*Sixth day.*—The whole of the injured surface was now covered with new cuticle; but as



it was yet very tender, the plasters were continued for some days to defend the new cuticle; he was therefore at that period regarded as cured.

When I compare this case, in many points resembling that which happened to Boerhaave himself, I am astonished at the different results. In Boerhaave's case "an unsightly scar remained on the arm after a tedious suppuration; " but in Mr. Hopper's case, which comprised an injury of greater extent, the whole cure went through the different stages of irritation, suppuration, and cicatrization, all in the short space of six days. Surrounded as Boerhaave was, with pupils from all parts of Europe, the treatment of an accident happening to himself, and suspending his lectures for a week, was calculated to make a striking impression upon their minds; accordingly we find it did: for his learned commentator, Van Swieten, details the case and recommends the practice for others; it also continued to be the orthodox practice until the appearance of the former edition of this essay in 1797, and even yet is the practice of the Parisian school. The three last cases related, and treated upon principles so directly opposite, terminating so very successfully, fully illustrate the practical utility, as much as the theory does the justice of the philosophical principle. In my treatment of cases of this nature, I think I may venture to use the motto of Asclepiades. "*Tutò, celeriter, et jucundè.*"

## CHAPTER VI.

EXTRACTS AND REMARKS UPON THE COMMUNICATION OF MR. DAVID CLEGHORN (AN UNPROFESSIONAL MAN) TO MR. JOHN HUNTER, ON THE TREATMENT OF BURNS AND SCALDS.—LETTER FROM THOMAS LEIGHTON, ESQ. SURGEON TO THE NEWCASTLE-UPON-TYNE INFIRMARY.

**T**HE contents of this chapter were added to the former edition of the essay as an appendix. The second chapter was allotted to the opinions of medical authors upon the treatment of burns, but as this will contain opinions of an unprofessional observer, I have thought it better to keep it detached. In the second volume of *Medical Facts, and Observations, &c.* there is a paper by the late Mr. John Hunter, containing remarks on burns and scalds, communicated to him by Mr. David Cleghorn, a brewer in Edinburgh. He avows himself to be unbiassed by any theoretical opinions, adhering strictly to the appearances resulting from his experience; from which he concludes, that the certain repeated effects he observed were produced by as certain known causes.

Mr. Cleghorn recommends the immediate application of vinegar, which is to be continued for several hours by the most convenient means, until the pain abates. Should the pain return, the vinegar must be repeated. If the burn has



been so severe as to have destroyed any part ; when the pain has ceased, it should be covered with a cataplasm made with bread and milk, which must at first be renewed every six or eight hours. As soon as any moisture appears from the use of the cataplasms, it ought to be covered with *finely prepared powdered* chalk, until every appearance of moisture is done away ; over which the cataplasm is to be again applied. The same is then to be repeated, every night and morning, until the parts are healed. If the continued use of cataplasms should relax the surface of the wounds and cause an increased secretion of pus ; a plaster, or ointment formed with litharge, should be had recourse to ; at the same time the chalk should be applied to the surface of the wound.

With respect to general remedies, Mr. Cleg-horn observes: “ I allow my patients to eat boiled or roasted fowl, or in short any plain dressed meat they like ; and I do not object to their taking (with moderation, however,) wine, spirit and water, ale, or porter. My applications, as hath already been observed, allay pain and inflammation, and always prevent or remove feverishness ; and at the same time (if one may judge from effects) they have powerful antiseptic virtues. I have never had occasion to order bark, or any other medicine whatever, and I have only once thought it necessary to let blood. When a patient is costive, I order boiled pot-barley and prunes, or some other laxative nourishing food, &c. sometimes an injection, but never any *purgatives*. It is distressing to a patient with bad sores to be often going to stool. Besides, I have remarked that weakness and languor (which never in my opinion hasten

the cure of any sore) are always brought on, more or less, by purgatives. From the effects too, I have felt them to have upon myself, they do not seem to me to have so much tendency to remove heat, and feverishness, as is generally imagined; and I suspect that, contrary to the intention of administering them, they oftener carry off *useful humours*, than *hurtful ones*. But I am going out of my depth, and exposing myself to criticism, by speaking upon a subject that I surely must be ignorant of: I will therefore return to my vinegar. I have already said that I always prefer wine-vinegar when it is to be had; I have however used with very good effect, vinegar made with sugar, gooseberries, and even alegar; but whichever of them is taken, it ought to be *fresh* and *lively tasted*.

I once made some trials (on a burn I met with myself) of oil of vitriol diluted with water, and of different degrees of strength; but I found its effects to be the very reverse of vinegar: for it increased the pain and heat, even when it was pretty much diluted. I make no doubt but distilled vinegar might do; but since the common sort, when fresh and good, has in every case been so efficacious, there seems to be no occasion to attempt improving upon it; and as acids are of a pungent penetrating nature, perhaps it would not be safe to apply one too strong to a raw and tender sore. Even the common vinegar, only by being used too cold, affected two of my patients with tremblings and chillness which alarmed me a good deal. I removed these symptoms indeed (as I before mentioned) very readily, by warming the patients' feet with cloths dipped in warm water, and giving them warm spirit and water to drink;



but ever since, I have been careful to use precautions against the like symptoms, particularly in cold weather, by warming the vinegar a little, placing the patients near the fire, giving them something warm internally, and in short by keeping them in every respect in a *comfortable condition*."

The number of cases related by Mr. Cleg-horn, in his communication to Mr. Hunter, as well as a still greater number which had occurred to him during a period of seventeen years experience, merit attention from the medical practitioner. When compared with the old oily practice, there can be little doubt of its being an improvement: for nothing worse than that could be well conceived. I am sorry I never had, nor am I now likely to have, an opportunity of making the comparison myself; but I have an authority to produce, which may even carry more weight than my own; as in a stranger there can be no personal bias in favour of one opinion more than another. Mr. Badley, of Dudley in Staffordshire, has compared the use of vinegar with that of essence of turpentine, and gives the preference to the latter. His letter will be seen in another part of this essay.

Mr. Cleghorn recommends powdered or scraped chalk to be applied upon the surface of the sores, as soon as secretion takes place; this is done, considering it as an absorbent. It was with the same intention I used large quantities of the lapis calaminaris, as related in the case of Thomas Johnson. The chalk used for this purpose should be washed in several waters, and finely rubbed into a powder, so as to

prevent any mechanical stimulus; but where the neighbourhood affords an apothecary or chymist, properly prepared chalk is always to be procured. When the chalk is in this finely divided state, it unites with the mucous secretion of the abraded skin, and favours the formation of cuticle in a quicker manner than any other substance I am acquainted with. It is therefore of use in a variety of morbid secretions, as well as in burns. I gave an account of its use in open cancer; and it continues to be employed by Mr. Young, in his new and judicious method of treating that disease.

Mr. Cleghorn remarks, that on using the vinegar cold, he brought on tremblings and chillness, which he afterwards avoided by using it warm; and he recommends that in all considerable cases it should be so employed. This observation is valuable, as it shews the propriety of not too suddenly withdrawing the stimulus of heat. It is extraordinary, that no medical author should have noticed the violent shiverings which are constant attendants upon injuries of this class. I have invariably found them occurring as the first marked symptoms, and have been much aided in forming a prognosis of the extent of mischief done to the general system by the accident. The irritative fever is in proportion to the violence and the frequent recurrence of the shivering fits.

Mr. Cleghorn is the first whom I have found object to the bleeding and purging system. It is remarkable, that the doctrine of the schools should have been implicitly followed for several centuries by the regular faculty, and that an unprofessional man should be the first to see the inutility of the antiphlogistic regimen; of



the bad effects of which, at the beginning of such accidents, I am fully convinced. The benefit to be derived both from purging and bleeding, in a different stage of the accident, has been already pointed out, and will be further illustrated in another part of this essay. The facts noted from the experience of Mr. Cleghorn, are of great importance, as they are made by an unprejudiced observer; they also accord with my experience, and are readily explained by the theory I have adopted; which theory I legitimately deduce from the success of the practice.

The following Letter from Mr. Leighton, Surgeon to the Newcastle Infirmary, and many years Secretary to the Medical Society of that place, will add weight to the testimony already advanced of the superiority of the mode of treatment I recommend, above that which has hitherto been empirically followed in the vicinity of Newcastle:

“ DEAR SIR,

“ I have tried the *fluor volatile alkali*, and the *ol. terebinth.* in a great many cases of Burns, and have great pleasure in saying, that either of them has a better effect than any thing I have hitherto used. When I first commenced practice, the liniment composed of *linseed-oil* and *lime-water* was the application in general use, particularly for the burns of the people employed in the collieries, and was used in such quantities that the miserable patients were kept constantly soaked in it: their beds and bedding were often rotted, and the effluvia arising from it, and the discharge of the sores

must have been no less noxious to the patients themselves, than intolerable to the surgeon. The greatest objection, however, to it was, that it did not answer the intention: it merely soothed the parts, and procured a temporary relief from pain and smarting, without stopping the progress of inflammation; and it did not tend to promote the suppuration, consequently the healing process was tedious.

“ Being dissatisfied with this application, I made trial of the *aq. vegeto mineralis*, and found it very useful in abating the violent heat and smarting, which is the immediate effect of fire; but in cases where the skin is much destroyed, and the eschars are deep, it does not seem to be so well adapted. In looking into authors on the subject of burns, I had found various stimulating applications recommended; but never having seen them used, I had not sufficient confidence to try any of them, until you recommended the *fluor volatile alkali* to me, and explained in a very clear and candid manner your ideas on the subject, and at the same time informed me of the result of your practice: I have ever since that period made use of the *fluor volatile alkali*, or *oleum terebinth.* sometimes one and sometimes the other, and can hardly give the preference to either, both having the same good effects. On the first application, the patient complains of a short increase of heat and smarting, which is immediately succeeded by a pleasing sensation of cold; and continuing to apply it a little longer, the patient becomes quite easy, and in general has no return of heat and smarting; the inflammation is checked, suppuration advances kindly and speedily, and the healing



process is readily compleated. In many slight cases no suppuration was induced, the cuticle peeling off, and leaving a new one underneath. I use *Goulard's cerate* only as a dressing in the slighter cases; but when the skin is much destroyed, and there is likely to be considerable eschars, I employ a stimulating ointment, such as the *ungt. resin. flav.* with *ol. terebinth.* which I always find promotes this ready suppuration. I have had no case where the injury was so extensive, and the consequent affection of the system so considerable, as to require the exhibition of stimulants internally; but I must observe that I have not been so strict in keeping my patients to the antiphlogistic plan as formerly, nor have I had occasion to give opiates so largely as when I pursued a different practice.

“ With best wishes for success in your endeavours for the improvement of your profession, to which your zeal and industry justly entitles you,

“ I remain, dear Sir,

“ Your's sincerely,

“ THOMAS LEIGHTON.”

*Westgate-street, Newcastle,  
Nov. 6th, 1796.*

This letter will convince the faculty, that the novelties I recommend may be safely tried by others. I only request a trial of the practice before I am judged, as I wish all conclusion to be in abeyance, whilst the judgement is employed in investigation.





## PART THE SECOND.

### CHAPTER I.

PRELIMINARY OBSERVATIONS.—MR. BELL'S EXAMINATION.—AITKIN'S SYSTEM OF SURGERY.—DR. UNDERWOOD'S TREATISE ON THE DISEASES OF CHILDREN.—PERKINS'S METALLIC TRACTORS, AS A CURE FOR BURNS.—IMPORTANCE OF THE INVESTIGATION.

**I**N the former part of this essay, I entered somewhat at large on the different and inconsistent methods, pointed out in various systems of surgery, for the treatment of accidents inflicted by means of fire. The principles there recommended further experience proved to me, were founded on nature and truth. I was therefore anxious that they should influence the practice of others as well as my own. The following communication from Mr. BELL, a pupil of mine, who on being examined as to his qualification for a surgeon in the navy, convinced me that the opinions I had advanced were not generally known, and that they would meet with pretty general opposition, being so contrary to former prejudices and to the opinions of authors. Dr. Blane and Dr. Johnston were the examiners.

“ Having mentioned scalds and burns, among the accidents during our cruize, Dr. Blane said, ‘ Pray, Sir! how did you treat them?’ I replied, ‘ By bathing the affected parts with oil of turpentine.’ ‘ Oil of turpentine? Good God, Sir! that is a practice I must condemn in the severest terms; and I think you, Dr. Johnston! will agree with me in reprobating it.’ Dr. Johnston said he never heard of such a remedy before, but asked upon what principle or what theory I could justify it? I said, that when a patient had any member so much exposed to severe cold as to become *frost-bitten*, it was usual to apply, first snow or ice, and afterwards cold water, before any degree of sensible heat could be borne without injury—that for the same reason, when a part had been violently stimulated, it was equally necessary to bring it by degrees down to the healthy standard—that this object was best accomplished by the application of a stimulus a little less violent than that which had caused the diseased action; and that the oleum terebinthinæ had been found by experience equal to produce that effect. ‘ On what experience?’ said Dr. Blane. ‘ On that of Dr. Kentish, of Newcastle-upon-Tyne, who has written an essay on the subject, in which the superiority of this method of practice is proved beyond a doubt, at least in my opinion.’ ‘ Does it not,’ said Dr. Blane, ‘ produce (meaning the oleum terebinthinæ) great pain?’ I answered, ‘ No, not in the least: on the contrary, it is soothing and agreeable to the patient.’ I then narrated to them the case that Mr. Anderson communicated to you. That of the child I noticed in my former letter, and also the innumerable cases I had seen while with you, where the patients were *flayed* from head to foot.’



The above was written to me immediately after his examination, which he passed with great credit to himself, being deemed eligible for the highest situation in the naval department. The above is therefore written without any intention of reflecting blame on the characters of either Dr. Blane, or Dr. Johnston, who, on this occasion acted with great liberality in receiving with candour information which went directly to oppose the opinions, prejudices, and practice of their whole lives. As the principles upon which my treatment of burns are founded may at first shock the prejudices of practitioners, but must, when found true, influence their practice in a variety of instances, I am anxious for their general diffusion.

In the first part of this essay, I have shewn the impossibility of acquiring a rational mode of conducting an accident of this kind, from the works of any of my predecessors on this subject. A collection of various means are to be found, it is true, but nothing to aid or assist his judgement in making his election. This very fact announces the necessity of my undertaking, and will plead as an apology for my prolixity; I shall therefore venture to give an example or two more, from other systems.

Mr. John Aitkin of Edinburgh, in his *Elements of Surgery*, has given us the following nomenclature for accidents of this nature:

|              |                    |
|--------------|--------------------|
| “ Combustura | } of the Latin     |
| Encausis     |                    |
| Ambustio     |                    |
| Adustum      | } of the French    |
| Brulure      |                    |
| Burning      | } of the English.” |
| Scalding     |                    |

He then proceeds to give several aphorisms containing very opposite opinions, but finishes with the following, which appears to speak his real sentiments. "The combined effects of the general and topical antiphlogistic remedies are necessary in the cure of the more severe burnings. The exquisite increase of sensibility, not only forbids the external use of any stimulant matters, but on the contrary, demands the most bland and soothing coverings. Is not opium peculiarly indicated? Are not *ardent spirit*, sugar of lead, and lime-water, likely to prove hurtful external applications?" From the above extract we collect the opinions of Aitkin, which we may conclude agree perfectly with all the antiphlogistic plans I followed in the first mode of treatment. The application of oil and opium I have already appreciated, and it does not stand higher in my estimation than oil alone. It will be unnecessary to make any further remarks upon Aitkin's system, as it is glaringly obvious, that I regard the *general* antiphlogistic plan, as the least efficient of any that could be pursued.

I shall now make some observations on Dr. Underwood's *Treatise on the Diseases of Children*, a book I have frequently found in the hands of mothers of large families; it is therefore of great importance to correct any erroneous opinions it may contain. Before I proceed further, I beg to remark, that I have not the pleasure of Dr. Underwood's acquaintance, and that I have no personal prejudice for or against him: my warfare will be limited to what appears to me his erroneous opinions; as I both expect and wish that my own errors



should be so treated. I hope this apology will be accepted by all with whom I may differ in opinion. Under the head *Ambustiones*, p. 106, vol. ii, scalds and burns are treated of. The remedies recommended are, on the one hand, *wine, brandy, spirit*, and *holding the part to a moderate fire*; on the other, *lime-water, litharge-vinegar, cold water, and ice*, to be renewed day and night. As these opposites are nearly balanced, and the mother or nurse might be in a dilemma, like the poor ass between two equal bundles of hay, the Doctor has kindly held out an alternative by giving another remedy which he deems the best. It is a liquid soap made with six ounces of oil, ten ounces of water, and two drachms of aqua kali. He says, "could a person scalded all over, be instantly put up to the chin in a *cold* bath of this kind, and the head at the same time be frequently immersed, or well washed with the liquor, I believe very little injury would ensue." As for this best remedy, it is to be applied cold, therefore I have no opinion of it; and for the others, it is barely possible to suppose opinions more calculated to lead the minds of persons who consulted the work, into doubt, than those advanced. Dr. Underwood, in a note at the end of this article, says, "for some new ideas on the nature of burns and their treatment, the reader is directed to an essay written by Dr. Kentish." The Doctor had certainly never read my essay, or he would not have left the article in the state I found it. Perkins's Metallic Tractors are also ranked amongst the means of cure, in cases of burn; but Dr. Underwood very judiciously advises no trust to be placed in their use in such cases. Dr. Warwick, of Rotherham in Yorkshire informed

me, that to cure a person of his acquaintance of the absurd belief he had in the power of the tractors, he permitted both his hands to be scalded: to the one his credulous friend assiduously applied the tractors, whilst to the other nothing was applied. In spite of his unremitted labour, the believer in tractors had the mortification to see, that the scald to which nothing was done went through the same stages, and was cured in the same time, and in the same manner, as that to which he had so unceasingly applied the tractors.

The opinions collected in the former part of this essay, together with these now adduced, will point out to us the uncertainty and imperfection of all modes hitherto recommended both by medical and surgical authors. As many lives fall a sacrifice to accidents of this kind, the importance of investigating the proper principles upon which such accidents ought to be conducted, I trust has been made apparent. That importance will also plead my apology for again obtruding the subject on the notice of my medical brethren. In severe cases of burn, the combined powers of medicine and surgery are both required; to unfold the vital powers of the system, and to enable it to resist the irritative and suppurative stages of the accident, requires a knowledge of the laws of the system, and a proper application of medical means to produce such an effect; to apply the most proper means to a sore of this kind, through all its various changes, requires an extensive experience in surgery. From attentive observance of the powers of the system in accidents of this kind, where we perceive her actions on the surface open as it were to view, we may the more readily



conceive the actions upon morbid internal secreting surfaces, which are hidden from our sight. Should the principles be established upon which I treat extreme cases of heat and cold, namely, burn and frost-bitten, these principles must also influence a variety of other cases. There are numerous diseases which owe their origin entirely to a change of temperature; and there are none which are not more or less influenced in their course by the modifications of heat and cold. Scarcely on any subject is our knowledge more confined than on the effects of heat and cold upon the living body. For how many ages has it been asserted by the faculty and believed by the public, that warm baths are debilitating; what a combination of relative ideas are necessary to determine the assertion; and, when made, it could only be relative to an individual, as different habits or circumstances would lead to a different conclusion.

## CHAPTER II.

OBSERVATIONS ON SIR JAMES EARLE'S PAMPHLET  
 "ON LESSENING THE EFFECTS OF FIRE UPON  
 THE HUMAN BODY, ETC."—HE LAMENTS  
 THE GENERAL WANT OF PRINCIPLE FOR THE  
 TREATMENT OF SUCH CASES.—AS HEAT HAD  
 PRODUCED THE INJURY BY ENTERING INTO,  
 AND REMAINING IN THE BODY, IT WAS SUP-  
 POSED COLD WOULD BE THE BEST APPLICA-  
 TION TO DRAW IT OUT OF THE BODY; WITH  
 THIS INTENTION, ICE AND COLD WATER WERE  
 USED.—CASES RELATED AND REFERRED TO  
 BY SIR JAMES EARLE.—CASE OF A YOUNG LADY  
 UNDER THE CARE OF SIR WALTER FARQUHAR,  
 NARRATED BY HERSELF.—REMARKS ON THAT  
 CASE, PATIENTS NOT HAVING EXPERIENCE,  
 CANNOT FORM A CORRECT JUDGEMENT OF  
 THEIR TREATMENT.—EFFECTS OF HEAT AND  
 COLD UPON THE SYSTEM, FROM WHICH THE  
 PRINCIPLES OF THE NEW PRACTICE ARE DE-  
 DUCED.—CASE RELATED BY THE LATE MR.  
 JOHN ANDERSON, SURGEON, OF NEWCASTLE-  
 UPON-TYNE.—RELATIVE EFFECTS OF DIFFE-  
 RENT PRACTICE ON THE SAME PATIENT.—  
 REMARKS UPON THAT CASE.

**A**N Essay entitled *Means of lessening the Effects of Fire upon the Human Body*, from the pen of Sir James Earle, requires my attention. It was published in the year 1799, and the



former edition of this Part was published in 1800. It would appear from Sir James's essay, that mine on the same subject had not fallen under his observation, although it had been published nearly three years prior to his. The *first* Part of this essay was published in February 1797, and his essay in November 1799.

As I have advanced a theory, and detailed a practice upon principles so diametrically opposite to those maintained by Sir James; I have no doubt he would have noticed them, had they fallen under his observation. I have not the pleasure of Sir James Earle's acquaintance; I hope therefore he will pardon any liberty I may take in criticising the principles of his essay; nothing personal can be meant: I shall attack the doctrine, but not the man. In a matter of such importance as the clearing of doubt or setting aside error, in the treating of an accident by which many lives may be either lost or saved, silence through false delicacy would be highly criminal, and compromise the dearest interests of humanity. There can be no doubt but the laws of the animal economy have been the same from the creation to the present time, though the knowledge of those laws may even yet be partial and imperfect. For ages previous to the art of writing or printing, the laws of the animal economy must have been contemplated by the different classes of men who devoted themselves to the art of healing. But as there were no means of recording their observations, each succeeding individual had to struggle with his own ignorance, and made more or less progress, according to his ability and opportunities for observation. At present it is different: the facts of the present age are collected for the

use of the future. Our many periodical works constitute a magazine of materials, from whence we may collect facts, to generalise in such a manner as to render more apparent the laws of the animal economy. Circumstances having placed me in a situation, which I thought afforded me means of appreciating the efficacy of different modes of treatment in injuries from fire; when therefore I observe opinions of a contrary tendency about to be impressed upon the public mind, I feel it my duty to expose what I deem their fallacious tendency. As a duty, I shall endeavour to perform it, I trust, in such a manner as to avoid offence to any individual, yet so clearly as to convince the reasonable part of my readers of the propriety of my opposition.

Sir James begins by lamenting the want of principles in the treatment of such accidents as happen from the influence of fire upon the human body, both in the ancient and *modern* authors upon this subject. He likewise notices some of the most common and contradictory applications, and adds, that many more formulæ might be enumerated. The remedies in general use, are intended to cool, to relax, or to give ease, and in some measure they answer these purposes: but they are far from furnishing adequate means to stop the progress or lessen the powerful action of the matter of heat, which probably continues to *exist* in the burnt part, and to extend its influence for some time. This opinion of the matter of heat remaining in the burnt part, has been supposed by many, and is a very prevalent notion with the vulgar: they imagine that until the fire is drawn out the process of cure cannot go on. Fourcroy recommended the fluor volatile alkali upon



the same principle. Chaptal also appears to be of the same opinion ; but, as this is an abstract question which might lead to a wordy warfare, we had better set it aside, and confine ourselves to that on which there can be no difference of opinion, namely, the effects of fire. When caloric is applied to the body, it produces a variety of effects, according to its degree of intensity and the duration of its application, as well as according to the peculiar structure of the parts to which it is applied. When these effects are produced, I have already pointed out the means I should use to counteract them, and the principles upon which I employ such means.

I shall now proceed to relate Sir James's treatment, and principles upon which it is founded. The first case Sir James relates is one which happened to a medical gentleman, who being near a bottle of spirit of wine which took fire, the bottle burst, and the contents were thrown over his hands, face, and the upper part of the neck, all of which were miserably burnt. "At a consultation," says Sir James, "on this unfortunate case, the usual modes of treating burns were discussed ; and from a thorough conviction of the little good to be derived from the applications in common use, it was agreed that after the loss of some blood, cold water alone should be applied to bathe the parts ; and this being found to give ease, was constantly renewed, and the patient during several days *drank* nothing but *cold water*, and took very *little* nourishment. By these means he was kept in a cool and *tolerably* easy state, though the pain often returned at short intervals. Some blisters arose, which however in *little more* than a week subsided, and no scar was produced."

After this case, Sir James narrates that of the illustrious Boerhaave, which happened from the bursting of Papin's digester. It was treated by profuse bleeding, purging, low diet, and externally by the softest oily applications. The cure was effected by a tedious suppuration, which left an unsightly scar. For the sake of comparison, it is here adduced to shew the superiority of cold applications over unctuous ones; for, in every other respect, the treatment was nearly similar: bleeding, cold drink, and very little nourishment had place in both.

I wish this case of the medical gentleman had been drawn up with more exactness. The expression "*some blisters arose, which however in little more than a week subsided and no scar was produced,*" is indefinite as respects both time and manner. It may mean, that the *blisters* subsided in little *more than a week*, and that when the *sores* were healed, there remained no *scar*. But admitting this, the *sores* might be some time in healing, *after* the subsiding of the blisters. From the observation "*when some years since I was sent for to a medical gentleman,*" it would appear that this case had been drawn up from memory. As the recollection of a case *some years since* can only be general, the particulars are lost; which, had they been retained, would probably have given a different colour to the whole. I do not mean to impute a want of candour to Sir James; but when a medical man taxes his memory to support a particular doctrine, he seldom admits those facts which would weaken the conclusions he is anxious to draw from his premises.

I have likewise quoted the case of Boerhaave, the treatment and result of which I wished to



be compared with the treatment and result of a similar accident which happened to a medical gentleman, (Mr. Hopper) then my pupil; and his case was under my own proper care. The symptoms were drawn up at the bedside of the patient, and the detail of the practice was noted at the same time. The treatment was conducted scrupulously upon the principles I had previously laid down for such accidents. I have already mentioned that these principles forced themselves into my mind, in consequence of my want of success in former modes of treatment. Their weight obliged me to adopt them; though contrary in many respects to my habits, my prejudices, and my interest. I wish all these cases to be compared: for nothing more satisfactory as evidence could be brought forward, to substantiate the truth of the principles I am endeavouring to inculcate.

In the former part of this essay, I wished to bring under the observation of the public only those extreme cases in which life or death would be the result, according to the different modes of treatment. Such cases were then related, and my experience enabled me to assert that each would terminate in the loss of life, or the preservation of it, according to the methods pursued in the course of treatment. A very extensive experience warranting my assertion, I trust the following inference will be admitted: that to proceed upon the same principle in those slighter cases which would not affect existence, as in those extreme cases which would, must in a proportionate degree be beneficial. To have made such progress in what is generally termed a *conjectural act*, is more than I had a right to expect, and is

a great step towards rescuing this part of the art from such an *opprobrious title*. Sir James, in reasoning on this case of the application of cold water, says, “though the plan well followed up and renewed as often as possible, lessened the pain and abated the heat, it did not quickly *subdue them*; and in large and severe burns it seemed *disproportioned* to the violent effect produced by the fire.”

The next case related is that of a lady, who had her neck and face much injured from the burning of her neckerchief. There was a consultation in this case with Sir Walter Farquhar. He proposed the application of ice to all the burnt parts, although they were very extensive. Sir James Earle’s predilection for cold applications induced his immediate assent, and ice was accordingly applied; which, *appearing* to give immediate ease, was continued unceasingly during several nights and days; after which the lady recovered, without any scar remaining, or any injury to her health from the *cold state* in which she so long remained. This case, like the former, is evidently drawn up from recollection; and very little can be known of the degree of injury from the relation. That the lady had ice applied to her neck and face for several days, and that no ill consequences arose from its use, is good information. That she afterwards recovered without any scar remaining, we are told; but of what degree of injury she recovered we know not. Were the injured parts blistered or destroyed? Was there sloughing, or only a purulent discharge from the skin? How long was it from the accident before she was well? Of all these particulars we



are uninformed by Sir James's statement; but without such knowledge no correct judgement can possibly be formed. To convey accurate and precise information of all the actions of injured parts, from the moment of injury to the time of cure, is one of the most difficult tasks a medical author has to encounter; but in this case there is not an attempt of the kind: every difficulty is obviated by making general assertions only.

The next case is Sir James Earle's child, a boy of three years of age, who, playing with his brothers, was thrown down upon the hearth. To save himself, he caught hold, with one hand, of a bar of the grate. His father saw him in less than a quarter of an hour after: he was in exquisite pain, although the nurse had wrapped his hand in oil. Ice was immediately sent for, with which his hand was covered, and he got immediate ease; but as soon as the ice was melted, which was at first in a short time, the pain returned, and he cried out for more. A blister arose, (*this shews that the application of ice will not prevent the formation of blisters,*) which, by degrees, in one large bladder, occupied the whole of the palm of the hand, and the inside of the thumb and fingers, and it increased so as to become globular, and nearly of the size of a hen's egg. The opening or breaking of this was most carefully avoided; and ice was constantly applied to the whole hand, it being immersed during the day in a basin of ice and ice-water, and at night wrapped in cloths or covered with scraped potatoes soaked in it. Whenever the application was recent, the child was easy and slept; but at intervals, as the

hand grew hot from the melting of the ice, he became restless, and cried until it was renewed, when his sleep was again composed. This plan was pursued during a week, at the end of which an absorption of the extravasated lymph took place; the cuticle, which had been elevated to so great an extent, began to shrink and shrivel; in a few days it became ragged and torn, and was taken away without any painful sensation, a perfectly well-healed surface appearing underneath.

This case appears to have been attended by Sir Walter Farquhar, to whom Sir James Earle expresses his thanks for his kind attention, and gives him the credit of having first suggested the use of ice. During the attendance upon this case, their conversation frequently turned upon the efficacy of the means adopted; and they mutually regretted that the practice was so little known. This consideration induced Sir James Earle to write upon the subject. He makes the following observations upon his son's case.

“ If I am allowed to judge from the severity and situation of the burn, and from the soft and tender structure of the parts concerned in the case just described, and to reason from what I have seen in many others, I am decidedly of opinion that had it been treated by any of the means commonly employed, the inflammation would have been much higher and continued much longer; consequently the pain would have risen more severe and of longer duration, accompanied with fever.

“ From the great degree of heat and irritation, the blister would have continued to increase; and if the intentional opening of it, which by



some was advised, had been avoided, it would have burst; the admission of air would have produced a slough, in which the tendons would have been implicated; in consequence, the muscles, no longer serviceable, would have become contracted, and the hand for ever been left maimed and useless."

Such are the conclusions attempted to be drawn from this case. I must confess they are not in my opinion warranted from the premises. I shall therefore request the attention of my reader whilst I notice some of the facts stated in the account, from which I think I shall be allowed to draw very different conclusions.

It is said "a blister *arose*, which by degrees, in one large bladder, occupied the whole of the palm of the hand, and the inside of the thumb and fingers." From this it appears that the effusion had not taken place when the ice was first applied, but subsequently, and that it continued to increase until the whole palm, with the inside of the thumb and fingers, formed one entire bladder. It is plain from this statement, that ice thus applied neither stops the effusion of the exhalent vessels, nor excites the action of the absorbents to take up the effusion. I have frequently observed, when effusion has taken place, that absorption has been produced by the application of heated essence of turpentine, thus restoring the equilibrium of action upon which, in this state of irritated surface, the cure chiefly depends. The means capable of exciting absorption, when effusion has taken place, I have generally found capable of preventing effusion, when applied before that effect had been produced. Sir James, in this case, has

given certain facts from which we may form a judgment. The formation of a blister, in the early stage of burn, denotes to me the extent of injury the part has suffered: it enables me immediately to class it with injuries of increased action, and it should be treated according to the plan laid down in the former part of this essay for such accidents. Had the cutis been destroyed, there would have been no blister. The exhalent vessels were violently stimulated to increased action, but they were not destroyed. I do not see any reason for the extreme dread of opening the blister: had a small puncture been made, the collapse of the cuticle would have given greater effect to the application. As effusions upon the irritated surface of the body caused by a burn, a scald, or by cantharides are nearly similar, I cannot apprehend that a slough would have been the consequence of exposing the cutis to the air; for I have frequently known blister-plasters pulled off suddenly, so as to take away the cuticle, and the effusion absorbed by a cloth, which was attended with much pain and a greater secretion of pus; yet sloughing did not take place. From this fact, I have no hesitation in saying that none of the fatal consequences predicted by Sir James would have ensued, even had the blister been opened, or allowed to burst. From the data I have before me, I could venture to say, that had this patient been treated according to the plan laid down in the former part of my essay, he would have been well in half the time. I have frequently seen patients more injured than Sir James's son, who have been cured in two or three days, by what I would term the first intention; or, in other words, I will say, that



when effusion has taken place, the absorbents have been excited to an increased action, and have taken up the effused fluid, thus restoring the equilibrium of action between the exhalents and absorbents.

Several cases are next related, in which ice produced, according to the statements, the most salutary effects. To avoid tediousness, I shall pass them over, and go on to the case of a poor woman who, in a fit, fell into the fire. The injury extended over the whole of the neck, back and breasts: in short, nearly half the body was scorched, and there was one continued burn, which made a surface by measurement of more than four hundred inches. A considerable time had elapsed after the accident before she was brought to the hospital, so that the heat of the fire had scope enough to do great mischief. Added to this, the inflammatory attack had been aggravated by the injudicious application of spirits of turpentine, so that her sufferings were extreme. The burnt parts were covered as soon as possible with powdered ice and ice-water, from which she found immediate ease, and lived three weeks without complaining of much pain and without the distressing fever which usually accompanies severe burns. But she afterward sunk under the profuse discharge from so large a surface. Sir James then adds the following remarks to the above narration. "It is impossible to say what a more early application of ice might not have effected: much greater advantages would have been attained; since in other instances, where it had been early applied, although the burn had been both extensive and deeply inflicted, a stop has been put to the heat and inflammation, and sloughs

have been prevented forming. But considering this case abstractedly, if ice could act with such effect as to keep this patient so long alive and easy, what may not be expected from it in slighter burns?"

These observations of Sir James Earle's are evidently drawn up with much prejudice: the case of his son's hand getting well by the application of ice, and escaping the ills he contemplated, left a strong impression upon his mind of its utility. With this impression, he would look with horror at applications of a different nature; and for so fiery an application as spirit of turpentine, he could not conceive a rational being capable of applying such liquid fire. To form a correct judgment, it is necessary to know all the facts. Now, Sir James was unacquainted with the soothing power of spirit of turpentine in such cases, consequently he was not in a situation to make the comparison, or to judge of the relative merits of the two applications. It is said, that pounded ice and ice-water were applied, and that the woman lived three weeks. From the continued use of the ice in the other cases, I suppose the same was observed here until her death, which, it is said, happened from the profuse discharge of so large a surface. Admitting that ice may be proper to stop the inflammation, surely, when secretion of pus has taken place, it can be no longer necessary; for my experience in burns informs me, that when secretion takes place, inflammation to a certain degree ceases. The different stages of burns require very different treatment; but the application of ice and ice-water appears to me to be recommended all the way through, either to the cure or the death of



the subject. I beg I may not be supposed to recommend spirit of turpentine in the same manner: I have known much mischief by its too long continuance; but I trust I have pointed out certain appearances by which its utility may be ascertained, and its abuse avoided. As to the merit of curing slight burns, I do not wish to deprive ice or ice-water of such merit. Dr. Warwick's experiments respecting the tractors shew that the body itself has sufficient power to cure slight burns, without any application whatever. If I am enabled by one mode of treatment to save the life of an individual, who by any other would have perished, I think I may infer that in slighter cases of the nature, the same principle of treatment would be equally efficacious.

There is one case more related in Sir James's essay, which I shall notice; not that the case itself requires much attention, but merely as it is announced to have happened under the inspection of Sir Walter Farquhar. A degree of weight is thus given to it, which may induce a false estimate; as the opinion of a popular physician, even if erroneous, produces a considerable effect on the public mind. The case is as follows, and related by the young lady herself.

"Early in the month of March 1792, one morning just after breakfast, I went into the parlour to speak to my mother, who was sitting by the fire-side, so that I stood on the hearth with my back to the fire; and as soon as I had communicated what I had to say to her and my sister who was with her, I was going to quit the room, when the latter, looking up, perceived that the back of my dress was on fire. Fright deprived her of all power to act; but my mother

immediately endeavoured to extinguish the flames by wrapping her clothes around me, but in vain: the fire was become too strong, and as she concluded the carpet was nailed to the floor, she went out of the room to get something to throw over me. My first impulse was that of following her; when providentially I had the presence of mind to see that such a step must prove fatal; and throwing myself down on the carpet, I rolled over and over, begging my sister would try and cover me with it; which she could not do, being deprived of strength by fear. My mother soon returned with a large mat, and the servants, who had been alarmed by my screams, came in at the same instant to my assistance: they threw the mat over me, and themselves upon it, in order to smother the fire, and after some little time succeeded, but not before I was severely burnt in two places in the small of my back, the back of my neck, and the under parts of both arms, just above the elbows. I had burnt the fingers of my right hand in attempting to untie my muslin sash. My mother's hands also suffered; as on raising me from the floor, some fire blazed from the back of my handkerchief and cape of my gown, which she stroked down from my head and pressed out with her hands. When I had a little recovered from the shock, I sent off directly to request the favour of Sir Walter Farquhar, if at home, to come to me immediately; if not, that he might be informed of the accident as soon as he returned, and that I was impatient to see him. Three or four hours having elapsed, I sent again to Sir Walter; as he was not come home, one of the gentlemen from his house very obligingly came to me; yet I *declined* availing myself of



his advice, being *determined* to wait until Sir Walter could come to me, owing to the anxious wish I had of having his opinion and advice in preference to all others. In the mean time I had applied scraped potatoes to my hand, and some oil to the rest of the burns. About ten o'clock in the evening, Sir Walter arrived; and after he had seen the places which were burnt, he ordered some ice to be sent for instantly, and that I should have somebody to sit up with me all night, who was to keep constantly applying to the burns, cloths dipped in the ice [*ice-water, I suppose,*] and to be changed as soon as the chill went off; that if I became weary and could sleep, they should get some fresh hog's lard, and first wash it extremely well with water; after which it was to be beat up with ice [*pounded, I suppose,*] spread on linen and laid on the burns; but as soon as I waked, to use the ice simply as before. When Sir Walter left me, I had my bed immediately laid upon the floor, as being more easy and convenient to those who attended me, and strictly followed the directions the whole night. On first applying the ice, it made me shudder for a minute or two; but the pain I felt was soon abated, and in the course of the night I got a little sleep. At noon next day, when Sir Walter came, he found me in a fair way of doing well, and only requested I would persevere in applying the ice frequently, and, in the intervals, keep the hog's lard and ice to the burns. I soon experienced the benefit of this mode of treatment, for in a few days the fire was entirely *drawn* out, and though *all* the *blisters* had *broke*, not *one* of them had the least tendency to become a sore. [*This would appear to contradict the terrible consequences Sir James*

*Earle expected would have taken place, had the blister in his son's hand been broken.*] Considering how much I was burnt, the pain I suffered was comparatively trifling, which I was persuaded was entirely owing to the application of the ice. [*From what could this lady judge? It does not appear that she had ever been burnt before, or that she had seen others who had suffered.*] My mother, who also used the ice to her hands, was cured in a few days. In the course of a month or five weeks, I perfectly recovered, and have never since suffered the smallest inconvenience from that accident; nor did I at the time catch any cold, though I sat up for the most part of the first night with scarce any clothing, and as the ice dissolved of course I was very wet. [*This account does not speak much in favour of the comfort of this practice, to the feelings and habits of the patient.*] And though I had, before this accident, been for more than two years greatly indisposed by nervous complaints, I had not any fit, or those nervous symptoms which my friends were apprehensive would have been the case, after the terror and fright I suffered by the accident."

I have no doubt of the truth of this relation; but of what does it assure us?—Merely that this lady got the better of her burn, and that no ill consequences followed the very unpleasant mode of treatment. I believe all the histories of the cures of burns by all the opposite and ridiculous means that can be conceived; for I know that Nature possesses a power of curing burns of a certain extent unaided; nay further, that she can cure burns in spite of all the malpractices of officious ignorance. Dr. Warwick's experiment upon himself shews that Nature cures a



burn in the same time and in the same manner, when nothing is applied, as she does when the tractors are used. I think I may therefore conclude, that all cases of burns cured, or said to be cured by the tractors alone, are cases in which Nature, unassisted by art, has performed a cure. I shall therefore relate a case from Dr. Perkins's account of his tractors.

“ Your tractors, which I lately purchased to use in my family, I have applied with great success, upon a person scalded with boiling lye. A man by the name of WELCH, who was at work in my pot-ashery, when boiling down the lye, some of it flew into one of his eyes, which soon became very much inflamed, and swelled to such a degree that he could not open it, and remained in that situation for the space of three days. After the tractors had been used a few minutes, he was able to open it; and with two applications only, his eye was entirely free from pain and inflammation, and in a short time was perfectly well, although so badly scalded that he had despaired of its ever recovering.”

This account is sent to Dr. Perkins by James Glover, Esq. county of Troje, State of New-York. Here Nature had been at work for three days without any assistance, and had so far completed her work, that by a strong effort of the will he was enabled to open the eye. Without this stimulus upon his imagination, a few days more might have passed without his having opened it; but in the end, it would have been equally well as by this effort. Dr. Haygarth, treating on the powers of the imagination, has duly appreciated the effects of the tractors. He used pieces of wood, shaped and painted like the metallic tractors, with which he produced

the same effects upon several patients in the Bath Hospital, as with the tractors themselves. That to act strongly upon the imagination, either by hope or fear, is capable of rendering the body insensible of pain (within certain limits) is a fact that must frequently have come under the cognizance of every medical observer; and we may to a certain degree avail ourselves of it: it is only its abuse that should be guarded against. The histories of magnetism and tractorism serve to shew us how powerfully the body is acted upon from moral causes, and should be constantly kept in view by medical philosophers, whose task in drawing conclusions from the phænomena which may be presented to them is of the utmost importance, as the lives of thousands may be implicated by a false deduction. In all cases, where the *vis medicatrix Naturæ* is capable of restoring healthy action to diseased parts, we may account in a rational manner for the variety of remedies said to cure such morbid actions. The dead man's hand, the royal touch, the amulet, the sybil's charm, the magnet, and the tractors, will all *cure* diseases that would have cured themselves: happily for mankind there are many such. The great danger of a too extended faith in such a case is, that these remedies may be applied where Nature could not alone relieve herself; trusting therefore to such means when others were necessary, the patients would be lost, as many thousands have been.

The great object of Sir James Earle's book appears to have been, to advocate the practice of Sir Walter Farquhar, in applying ice in the treatment of burns. They imagine that fire enters into the body, and remains there in a state



capable of being brought or drawn out of it, by another body having a greater affinity to caloric than the body itself. Thus Sir James observes: "From every observation I have made, the fire does not produce all its effects on the first attack or immediate contact with the part, but afterwards lies *rankling* in it, and continues to spread its destructive influence until its *fury* is spent or its power concentrated, as is evident from the continuance and even increase of the excessive pain and inflammation." Again: "Whether modern philosophers will allow that fire applied to any part of the human body does remain united to it for a time, I am not certain; but such appears to be the fact; and this opinion, I find, has been maintained by several very respectable authors." As to opinions maintained by either ancient or modern authors, it would be endless to recount them. When we quit matters of fact and soar into the regions of fancy, we may spend years in repeating the idle visions of others, or in narrating the day-dreams of our own creation.

In the former part of this essay, I have detailed at some length the effects of different degrees of temperature upon the animal body. It there appears that animals have the power of preserving their existence under a varied degree of temperature, which is proportioned according to the perfection of their organization; and if the changes are gradual, the extent of their bearing such changes is greater. Man will exist many degrees below zero, up to 240 of Fahrenheit's thermometer, though rapid changes much within that range will destroy him. Such is his *glassy* essence, that it appears necessary to treat him as artists do that substance, viz. to anneal him,

by allowing his temperature to be changed gradually. In delicate constitutions, such is the narrow scale of accommodating power, that a change which is insensible to persons of a more vigorous frame produces so much disorder in the functions of absorption and secretion, as to occasion diseases of the most serious nature. What a difference is there between the delicate lady of our climate, who would be seized with catarrh by an ill-aired pocket-handkerchief, and a hardy Russian, who would plunge into a cold river, on quitting his steam-bath at 150 degrees of Fahrenheit !

The effect of a diminished quantity of heat in stopping circulation is proved by Mr. Hunter's experiments on the rabbit's ears, &c.; and the influence of heat, to quicken the circulation, is also proved by the action of a hot-bath upon the heart and arteries. I do not mean, by noting these effects of heat and cold, to deny the power of caloric (or fire) combining with or decomposing any part of the system to which it has been so applied. I am well convinced I could burn my finger to a cinder over an Argand's lamp; but after this decomposition, I should not expect that ice would draw out the fire and restore me my finger. When caloric combines with any substance, a chemical union takes place; and when this is done with the living animal fibre, it is at the expence of a destruction of organization in that fibre, which no human art can restore. Supposing a fibre, or part of a fibre, to be so destroyed, there must have been increased action previously to the part having been destroyed. Now it follows, that where destruction had ceased, increased action must have begun from this most active of all stimuli. If it be



granted that destroyed parts cannot be restored, it follows that those we have to take care of will class under the head of parts with increased action; in that case, I trust, I have pointed out in the former part of my essay the best known mode of treatment. Admitting, for argument's sake, that Sir James Earle's principle was true, viz. that the excess of heat should be drawn out by ice or any cold substance, would it not follow as a consequence, that in cases of defect of heat, as in frost-bitten cases, caloric or fire should be *driven* in, by approaching the parts to the fire, or by applying heated bodies so as to *thrust* in the necessary quantity of fire.? But this is not found to be true: frost-bitten parts, if brought too near the fire, drop off, as the experience of all cold countries would sufficiently attest. The following case will shew the danger of *thrusting in heat*, after exposure to cold.

In the month of January, 1800, there was a severe storm, in which many ships were lost, on the coast of Northumberland, and a great number of the crews perished, from the intensity of the cold. Three men thus suffering were taken to an inn, in a fishing-town on the coast. For one who was much frost-bitten, the good people of the inn, with the best intentions, prepared a hot bath, in which he remained for some time; they then put him to bed, and gave him some hot ale and brandy, to comfort him: the consequence of this treatment was, that the torpid actions of the system were so rapidly put into hurried motion, as to excite an irritative fever, which in the course of eight and forty hours exhausted the vital principle, and the man died. The other two, on whom so much *false* care had not been bestowed, escaped with difficulty; although they

did not use the hot-bath, yet they had a sufficient share of the hot ale and brandy to produce very unpleasant effects. If the principle laid down by Sir James Earle, of *drawing out* excessive heat, be just, the opposite practice, of *thrusting* in deficient heat, ought to be equally so. Yet the result of the above case shews us that it is erroneous.

From these cases, we see the life of an individual thrown away, and the lives of the others endangered from an improper treatment. There is no doubt, had these men been treated according to the principle of treating frost-bitten persons in Canada, that they would have recovered without difficulty or danger. If the injured parts had been rubbed with snow, or washed with cold water, and the accumulated irritability gradually drawn off, they would have been restored to healthy action. For the danger of allowing too great stimulus, after what is termed an accumulation of irritability, the histories of a variety of shipwrecks inform us. The narrative of the loss of the *Bounty* will supply us with many observations how to resort to the cautious use of accustomed stimuli, after a period of considerable privation. Had this poor frost-bitten mariner recovered after the use of the hot-bath, there can be little doubt but the good people would have attributed his recovery to their treatment. Supposing this to have been the case, we ought merely to have regarded it as one of those cases where the powers of Nature overcome the most pernicious interferences of art. It requires very considerable knowledge of the animal economy, to ascertain whether we have done good or harm in the treatment of any particular disease.



I do not mean to doubt the facts asserted by Sir James Earle, viz. that burns and scalds to a certain extent have been cured under the use of ice and ice-water: I only wish to place these facts in such a point of view, that we may duly appreciate the influence such means had in producing the cure. Many have been the attestations of tractors curing burns; but the experiment of Dr. Warwick shews that they possess no such power: for the curative power of Nature and the tractors go hand in hand. Now as nothing could be fairer to prove the relative power of the tractors and of nature than the experiment of Dr. Warwick, if I wanted to try the relative value between Sir James Earle's plan and my own, I think I could not do better than to follow his example, and try the effects of the different modes upon the same subject, at the same time. But as it might be suspected I should be a partial judge upon the occasion, it would be better to employ an impartial person, whose mind was free from any peculiar bias, and who, from his situation and knowledge of the subject, should be enabled to draw a just conclusion.

The following case was communicated to me by Mr. Anderson, surgeon, of Newcastle-upon-Tyne, a gentleman who had practised there for twenty years, a great part of which time he was surgeon to the Dispensary; he was a man of liberal education, extensive business, and much observation, and therefore in every respect capable of drawing the comparison. His letter to me is dated in the year 1798, consequently it was before the appearance of Sir James Earle's publication, and could have no reference to his plan.

“SIR,

My practice in collieries has not yet afforded me an opportunity of adopting your plan of applying stimulants in any desperate cases of burns; but in the slighter or superficial cases of burns, I have found them act like a charm. I am informed that the practice of immersing the part in cold water for the space of twelve or fourteen hours after the accident, is in general use in Edinburgh. As both the *oleum terebinthinæ* and cold water were used at the same time, but on different parts, in the case of Mrs. Kent (which I formerly named to you) I shall give you some particulars of the case.

“I am, Sir,

“Your obedient servant,

“JOHN ANDERSON.

“Newcastle, Sept. 8, 1798.”

### CASE.

“A Lady, in endeavouring to remove a pan from the fire which contained boiling fat, had the misfortune to receive some of it on her right arm and face. I saw her a few minutes after the accident, about nine o’clock in the morning: she was sitting on the floor, and her arm was immersed in a pail of cold water; her face was flushed and appeared *much* scalded, and she complained of great heat and pain in it. I immediately applied the *oleum terebinthinæ* to it, and continued it for a few minutes. She said that her arm was so much relieved by



the water, and it had succeeded so well in a former accident, that she wished to continue it for a few hours. I saw her about four o'clock in the afternoon: her face looked much *better*, and *was easy*. She had continued the immersion, *often* changing the water; but when her arm was taken out, though only for a minute, she complained much of the pain; indeed it *appeared* that the *inflammation* was *increased*. I recommended an *emollient poultice*, after she should be tired of the cold water. In the morning I called again, and was informed that the pain of the arm had been great during the night. The inflammation had extended above the elbow; several large vesications had been opened, and deep sloughs formed on her hand and arm. I applied a digestive ointment to these parts, and a large warm poultice over the whole. The face was perfectly easy and had no vesications, but the cuticle was a little abraded. I scarcely need add, that the arm required dressing daily for a fortnight after the accident."

Let us look at this case, and judge as we have done in Dr. Warwick's, with the tractors. There we observed no difference in the process by the use of the tractors; from which we concluded they were of no effect. Here we observe the most important difference in the two modes of treatment. We remark, that cold water will not prevent the inflammation, nor the forming of sloughs. Had this case been treated with cold water merely, though inflammation was caused and sloughs formed by the treatment, it is very possible it might have been blazoned forth, as shewing the wonderful powers of cold applications in the cure of burns. Fortunately

we have another part of the same subject injured by the same means, and at the same time. This, by a treatment upon an opposite principle, terminates in a very different manner: the pain is relieved, the inflammation is prevented, and consequently all the subsequent effects arising from these processes. The application of spirit of turpentine seems to have been so nicely adjusted to the degree of injury in this case, that every ill effect arising from the boiling fat was prevented: we may term it the cure by the first intention; for hardly any mischief was the consequence, except a slight abrasion of the skin.

How different was the result of these two parts! It is impossible to place the effect of treatment in a stronger point of view. Well might Mr. Anderson say that the *oleum terebinthinæ* acted like a charm in superficial burns. In the one instance we see injury prevented; in the other inflammation and sloughs are produced, which require a fortnight's treatment to effect a cure. This case will plead my apology to Sir James Earle for what I have advanced respecting his son's case: for the different effects of the treatment are so apparent, that I feel myself perfectly warranted in my former suggestions.

In my first edition of this part, I had related several more cases in which cold water was resorted to, some also where cold was applied by the evaporation of spirit of wine; but as the cases were trifling and led to no practical benefit, I shall now omit them: for I think I cannot place the two modes of treatment in a more contrasted point of view, than they now are in the case related by Mr. Anderson.



## CHAPTER III.

REMARKS ON THE TREATMENT OF BURNS, SHEW-  
 ING THE DIFFICULTY OF OVERCOMING THE  
 PREJUDICES OF EARLY HABITS, AND ESTA-  
 BLISHING PRINCIPLES FOR CONDUCTING THE  
 TREATMENT OF ANY DISEASE.—FIRST SPECIES  
 OF BURN.—SECOND SPECIES OF BURN.—THE  
 USE OF CARBONATE OF LIME AS AN ABSORBENT,  
 IN THIS, AND IN A VARIETY OF OTHER DI-  
 SEASES.—CASE OF GEORGE CLARK.—OBSER-  
 VATIONS ARISING FROM THE ABOVE CASE.—  
 CASE OF THOMAS PYLE.—CASE OF JOHN DUN-  
 WIDDIE, OCCASIONED FROM AN EXPLOSION OF  
 GUNPOWDER.—THE PRACTICE RECOMMENDED  
 TO THE SURGEONS OF THE NAVY BY DR. TROT-  
 TER.—ITS USE ALSO TO ARMY-SURGEONS.—  
 LETTER FROM MR. S. HAMMICK, SURGEON,  
 ROYAL NAVAL HOSPITAL, PLYMOUTH.—LET-  
 TER FROM MR. HORN, SURGEON TO THE NEW-  
 CASTLE INFIRMARY.—REMARKS UPON THAT  
 LETTER.—A SECOND LETTER FROM MR. HORN,  
 WITH OBSERVATIONS.—LETTER FROM MR.  
 FIFE, SURGEON, NEWCASTLE.—CASE BY MR.  
 BELL, SURGEON OF H. M. S. PELICAN.—OBSER-  
 VATIONS OF MR. BELL AND MR. WESTGARTH,  
 ON THE ANODYNE EFFECTS OF THE ESSENCE OF  
 TURPENTINE WHEN APPLIED TO THE BURNS OF  
 YOUNG CHILDREN, EVEN WHEN THE CUTICLE  
 HAS BEEN LACERATED.

**H**AVING, in the preceding chapter, combated the principle laid down by Sir James Earle and Sir Walter Farquhar in the treatment of burns, I shall not enter at large on the practice; which, from the detail, appears to me to require infinitely more discrimination than has hitherto been given to it, from what I can collect in Sir James's pamphlet. In the case where the patient died at the end of three weeks, as related by Sir James, I suppose the ice and ice-water were continued the whole time. Now, if the principle were admitted, that ice would draw out the fire, I can never imagine the extraction of it could require such continued application. The different series of actions a burn goes through, from its infliction to the cure, require a variety of modifications during the process; but, in this mode of Sir James's, there is nothing but an ambiguous use of ice and ice-water, through all the various stages of the injury.

I shall now proceed to bring forward further proofs of the truth of the principles I wish to establish in the treatment of burns. Nothing in my mind can do this so effectually as to bring forward cases treated on these principles by myself, and by others of the faculty, totally unconnected with me; from which a mass of evidence may be collected, so as to place the treatment on a sure basis, by the experience of enlightened practitioners capable of forming a just estimate of its value and truth. In the former part of this essay, I confined my relation of cases to those tremendous injuries which



would have terminated in life, or death, according to the different modes of treatment the practitioner should have been induced to pursue. I shall also now relate a case of this magnitude, and shall add others containing peculiarities highly interesting, as tending to illustrate the principles of action in the system, during different stages of cure. These principles are highly interesting; as they are not merely confined to the treatment of burns, but have a general influence upon the constitution, in the treatment of most diseases. I am not so sanguine or so little acquainted with the human mind, as to expect easily to change the prejudices or opinions of practitioners on this subject. The history of medicine, as well as that of all the sciences, shews us the tenacity with which former opinions, however erroneous they may be, are held. If men could resist the evidence of the circulation of the blood, and enter into combinations to resist the belief of such uncontrovertible facts, the doubting of which at the present day would be deemed egregious folly, if not insanity, how can I expect to be more successful? Upon the whole, I have found as much professional candour as I could reasonably have expected. The late Mr. Taylor, apothecary to the Newcastle Infirmary, (who, in accidents of this kind, viz. scalds and burns, acted as house-surgeon,) treated these cases in the old manner; but, from seeing the superiority of my mode of practice, he gave up his former opinions, which he had pursued for upwards of *forty years*. This was a triumph; but others who saw, still resisted conviction; and when more light was thrown upon the subject, they shut their eyes most wilfully.

In the year 1798, I had the opportunity of pointing out the superiority of the new practice, in a very striking manner, to the pupils of a public institution (the Newcastle Infirmary,) being partner with Mr. Abbs, the senior surgeon, who permitted me to have the treatment of any case I wished. A child was brought to the hospital, who had been burnt by its clothes taking fire: the neck, face, hands, and arms were very much injured. It was ordered to have the *oleum lini cum aquâ calcis* applied to it, and afterwards to be covered with plasters spread with *ceratum flavum*; then, when the paroxysms of pain recurred, to be again bathed with the liniment, as was formerly the practice. It was allowed a small anodyne at night, but otherwise the mode of treatment was antiphlogistic. The pain continued at intervals for several days: the injured parts did not suppurate, but on the third and fourth day tumefied, as did the contiguous cellular membrane. Much fever, with thirst, great restlessness; and, on the seventh and eight days a considerable coma supervened. On the ninth day the scene was closed by the death of the young patient.

About the same time a similar accident occurred, and was received at the Infirmary; which, from the circumstances stated above, came under my immediate care. I treated it in every respect according to the principles laid down in the former part of this essay, both externally and internally. The different stages of the complaint were so strongly and favourably marked, and the child recovered so speedily, and so perfectly free from scar or blemish, that the gentlemen who saw these two



cases assured me of their full conviction of its superiority. It was this case which produced the conversion of Mr. Taylor's prejudices of forty years' standing, and induced him afterwards to adopt my practice in the Infirmary. It was this case also which made such an impression upon the mind of Mr. John Hutchinson, at that time apprentice to Mr. Taylor, who was afterwards elected house-surgeon at the Manchester Infirmary; that he introduced the practice into that institution, where it became in such general use that the common order in burn-cases was "*curantur partes admodum Kentishii.*" I give this fact from a letter I received from Mr. Hutchinson. in the year 1802.

In the former part of my essay, I contented myself by dividing this class of injuries into two species; since which, I have not found it necessary to deviate from that arrangement. Each species, however, should again be divided into two stages. To distinguish these two stages from each other, the first I shall term the *stimulant*, and the other *the healing stage*; though in fact the first stage is not meant to stimulate, if by that term an increased action is meant, but only to excite such a weak degree of stimulus, as would prevent the dangerous torpor, which must take place, if the violent action excited by caloric were allowed too suddenly to cease. The former principles of treatment in these two stages I still retain; though in the detail of practice I have been induced to make some alterations, the advantages of which have to me been very apparent. The result I shall relate, for the guidance of those who may be induced to adopt the practice.

*In the first species, where only the action of a part is increased, I have not found any thing better than the heated oleum terebinthinæ, and the digestive thinned with the same.*

In superficial burns, when the pain has ceased, it will be adviseable to desist from the application in about four-and-twenty or eight-and-forty hours; as during that time, in many cases, the morbid action ceases; after which, should this application be continued, a secondary irritation commences. This secondary irritation causes redness, and assumes the appearance of a primary accident, which at first puzzled and perplexed me considerably. I have likewise been informed of this effect by several who have endeavoured to follow the plan. I am therefore anxious to guard against the pernicious consequences, of what has been termed my treatment. When this disposition to *re-irritation* shews itself, all *terebinthinate* applications should be laid aside: a plaster with the common ceratum flavum, or a cataplasm of bread and water, or linseed-flour, will be found the most effectual method to change such appearances. Two or three days will be sufficient for the application of the cataplasm; after which, should secretion take place, the calamine cerate, with powdered prepared chalk, will speedily complete the cure.

*In the second species, or in those cases where some parts have only increased action whilst other parts are destroyed, for reasons already assigned it will but be necessary to pay attention to the living parts; and as these living parts will class with the species of those parts which have increased action, the same means*



must be used in both cases. Where considerable eschars are formed, the internal treatment should be paid particular attention to; for the system has a variety of processes to go through, after an injury of this extent, before it can be restored to a perfect state. In every stage of these processes, the system may be considerably aided by our efforts. The increased action upon the surface should not be allowed to subside too quickly, for fear of the opposite state of torpor taking place. The patient should be placed in a hot room, or near a large fire, and afterwards put into a warmed bed, to avoid the shivering-fits so general and so pernicious after accidents of this kind. Caloric appears to excite the exhalent vessels in a greater degree than the absorbents, the consequence of which is serous effusion. The equilibrium of the exhalents and absorbents should be kept up as much as possible. As caloric excites the exhalents more than the absorbents, and destroys the balance of these systems, we must endeavour to find some application which, by acting more upon the absorbents than upon the exhalents, will restore the equal action to these functions. Heated essence of turpentine is the substance which, from extensive experience, I have found the most effectual in such cases. I have already pointed out that it should not be continued *too long*: for as caloric produces a certain irritation upon the exhalents, so does the continued use of turpentine excite an unpleasant irritation upon the absorbents. When this happens, it should be instantly desisted from, and the linseed-cataplasm applied as already mentioned. I have frequently found large

effusions, which were caused by the irritation of caloric, absorbed by the excitement of heated essence of turpentine; thus restoring by an appropriate stimulus the equal action of these functions, which had been disturbed by the application of too great a degree of caloric. When parts have been destroyed by caloric, and eschars formed, we must judge of our treatment of those parts by the effect our treatment has upon the less injured parts. As soon as suppuration takes place on the least injured parts, we may be assured that all is going on well. The separation of the eschars is a process of the system which requires time: we may assist Nature in her progress, but we must discriminate between assistance and improper interference: the exertions of the system in this stage should not be hurried. I have before mentioned the necessity of internal or general stimulants, and assigned the reasons for such practice at the commencement of the treatment. The excitement of the system through the medium of the stomach is the readiest method we possess to increase all the actions of the system to their greatest extent. We must, therefore, avail ourselves of this sympathy; and, during the time the part is excited to increased action by the caloric, we urge the whole to an increased action; by which means the equilibrium of action will be the least disturbed; but such mode is only to be continued for a certain time. The cure of injuries of this kind depends much upon the general treatment. In the remarks made on the case of Thomas Johnson, I mentioned a full diet being allowed him when secretion had taken place, with the



intention of supporting his strength under the profuse discharge of pus. The irritation caused by the treatment increased the discharge, and the sores were converted into drains which were most difficult of cure. The system, distressed by the excitement, became hectic, being attended with flushings, and a quick pulse, which continued for some time after the sores healed. A case I shall relate will confirm the truth of the observations made upon the impropriety of Thomas Johnson's treatment. A profuse secretion of pus having taken place upon an extensive surface, on the ninth day a counter-irritation was excited by means of a violent diarrhœa. The increased secretion of the intestines, and the irritation of the tenesmus, so suspended the secretion of the sores, that their surface was nearly dry. Before the sores again secreted much, there appeared a so nicely balanced action between absorption and secretion, that the skinning process was effected more rapidly than I ever before perceived it in any case. This accident not only shewed me that I was wrong in improperly exciting the system before, but it also shewed me the power I might gain by counter-irritation. I have benefited by this lesson, and have produced very marked good effects by imitating Nature. Smart cathartic doses of calomel and jalap I have found to produce such counter-irritation, as has greatly facilitated the process of healing. Much assistance may be acquired by paying attention to the state of secretion on the surface of wounds; and, by irritating other surfaces, a quiescent state of the sore may be produced, which wonderfully favours the formation of skin.

Formerly I felt much difficulty in pointing out an adequate power to repress the growth of fungus, and to absorb the redundant purulent secretion. In Thomas Johnson's case, the treatment lasted more than a year; during which time various astringent and absorbent means were applied, all of which were inadequate to produce permanent good effect, and required frequent changes to complete the cure. Even after the cicatrices were formed, they were tender and unseemly.

In the sixth chapter of the first part of this essay, I noticed scraped chalk, as recommended by Mr. Cleghorn of Edinburgh, to be used in the latter stages of burns, with the same intention as I had done other absorbent substances. If the chalk is properly prepared, according to the directions of the Edinburgh Dispensatory, and then finely triturated in a marble mortar, it is one of the best applications. It may be mixed with a fourth part of fine starch-powder, which in some cases is a good addition. I have thus used it in erysipelatous effusions, with good effect. Sir Everard Home, in his *Treatise on Ulcers*, has recommended *pulvis cinchonæ* as a tonic absorbent; he has also recommended *pulvis rhabarbari*, and several other medicinal substances. I have used several of these applications, but to no good end. Chalk seems to have a further effect than merely that of absorbing. Lime forms a constituent ingredient of various parts of the animal economy. The bones of animals are formed by the phosphoric acid united to lime and gluten; the feathers of birds, the hoofs and nails of animals, and the cuticle of man, contain a small proportion of its carbonate (i. e. chalk) as well as



phosphate of lime. The shells of some testaceous animals in the South Sea are extremely large: the kemo shell on the coast of Sumatra is frequently found three or four feet in diameter, as white as ivory. The shells of birds also contain both carbonate and phosphate of lime. The body of the egg contains neither phosphoric acid nor lime; it was therefore necessary that Nature should provide means of furnishing both these substances, which is done by the shell, which becomes thinner and thinner during the whole time of incubation, until the living embryo has appropriated a sufficient quantity for the formation of its bones and feathers. When fowls are prevented from getting calcareous matter with their food, they lay eggs without shells. We thus observe that lime is necessary to complete some of the animal functions. Carbonate of lime not only acts as an absorbent in a superior manner to the lint which is in general use with most surgeons, but it seems to coagulate and unite with the gluten of the secreted fluid, and thus forms the basis of the new cuticle or shell which Nature provides for her defence. I have frequently seen very extensive sores, where the cutis has been excited to a profuse secretion of pus, probably to a pint in the twenty-four hours, make rapid progress in healing by the use of chalk. In the case of George Clark, which I shall presently relate, I was wonderfully struck by this effect. There was a profuse secretion one day, when a casual diarrhœa occurred; and on the following day, when the chalk-plasters were removed, a pellicle of new skin was formed, of the extent of both my hands, having that beautiful pearly or blue shelly appearance which is

observed to form about sores rapidly healing. The progress of skinning was greater in twenty-four hours in that particular case, than I have observed it in as many days where a similar sore was treated upon the old plan, with oily applications and generous diet during the state of secretion; given under the idea of supporting the patient's strength whilst such a profuse discharge was going on. From the great advantages I experienced in the formation of skin by the use of carbonate of lime, I was induced to use it in cases of cancer: I gave an account of it in a publication that appeared in 1802. I there observed that by the use of adhesive plaster, to supply the want of the natural pressure of sound integument, I thought an equal action of the absorbents and exhalents might be kept up, by which a cure would be effected; and the carbonate of lime, from its apparent powers of forming cuticle, I expected would facilitate the attainment of that object. By a change in my professional pursuits about that period, I ceased to have an opportunity of carrying my views into practice. I am happy, however, to find the principle is neither forgotten nor neglected, but is likely to succeed through the exertions of Mr. Young, who has adopted the practice with considerable success, in cases deemed cancerous.

When secretion takes place, powdered chalk alone, or mixed with a fourth, fifth, or sixth part of starch-powder, heated to one hundred degrees of Fahrenheit's thermometer, should be applied plentifully upon the secreting surface. If the parts are so situated that a sufficient quantity of the powder cannot be applied to absorb the secretion until the following dressing, dry lint sufficient for that purpose may be put over the



chalk, which should be covered with a plaster of wax and oil. I have found the use of this powder, from the commencement of secretion to the period of final healing, of the greatest advantage: it prevents in general the growth of fungus; consequently all the train of astringent applications are avoided, and the cicatrices are rendered much more seemly. I shall now produce a case illustrative of the advantages I have been relating.

### CASE.

October 20, 1798, GEORGE CLARK, a workman in one of the mines upon the river Tyne, young and vigorous, of the age of twenty-five, by a quantity of carburetted hydrogen gas taking fire in the mine, was immersed for a considerable time in the disengaged caloric from combustion. He had neglected to put on drawers, which the miners in general wear and always ought to wear: he had on only a flannel shirt with sleeves, which had large holes in various parts of the arms; the collar of the shirt was open, and exposed the neck and breast. In looking at the state of this young man, we might see how he was exposed to the action of the flame: his legs, thighs, posteriors, and privities were all burnt, as were his hands; there were large patches of burn upon the arms, through the holes in the shirt-sleeves; his neck, breast, and face also suffered. Immediately upon the flame ceasing to act upon him, he had a severe shivering-fit, which lasted for some time, and alternated with a violent sense of burning. From what I could learn from him, this alternate

shivering and sense of burning occurred about every half hour until I saw him; this was full three hours after the accident, which had happened about eight o'clock in the morning. A cordial draught, with sixty drops of tincture of opium and two drachms of vitriolic æther, was given to him about eleven o'clock; and he was profusely bathed with heated essence of turpentine for some time: over the parts bathed were applied plasters thickly spread with unguentum resinæ flavæ, rendered to the consistence of a thin ointment with oleum terebinthinæ. He had a volatile cardiac julep, of which he was to take a dose every three hours; the anodyne was repeated at night, with forty drops of tincture of opium; and the same was to be given on the following morning, an hour before the time of his being dressed, which took place at nine o'clock. In case of thirst, he was allowed to drink wine and hot water in equal parts.

October 31.—*Second day.* He grew easier soon after he was dressed yesterday, but did not remain so long, as the pain returned afterwards as violent as before; he had alternate paroxysms of pain, with intervals of ease during the day and night. He was very thirsty, and had taken more than a pint of wine with hot water, besides his cordial medicines and anodyne. The face was much swollen, particularly about the lips. The face of a person in the confluent small pox would convey some idea of his appearance, or what would still be more like, the swollen and bloated look of an erysipelas of the face. Some vesications had arisen upon the neck, which were all carefully punctured with the scissars' point, to discharge the effused serum. Vesicles had also appeared upon the hands and



wrists. The cellular membrane of the hands and arms was so full and tense, that the pulse could not be felt at the wrists. The pulse, felt in the axilla, beat 130. Several vesications had formed upon the legs and thighs, which were opened as the others. The left thigh, the buttock, and the verge of the anus, seemed to have suffered the most; a dry brown-coloured eschar had formed in different parts of the thigh. From the aspect of the face, particularly in regard to the lips, I was apprehensive of some internal irritation, from his having inspired some of the flame. The irritative fever was so excessive, and the appearances altogether so formidable, as to leave me very little hope of his recovery. But being confident in the propriety of the practice, by the result of former experience, I had no hesitation in prosecuting with energy the practice I had formerly pursued, though I might ultimately be foiled in my endeavours to save the life of the individual. The washing the parts with essence of turpentine, and the dressings, were the same as before; but, in addition, his lower limbs were laid upon large towels covered with hot emollient poultices, which enveloped the thighs over the plasters. Several bags of poultice were applied to different parts, particularly to the face; and orders were left to do the same to any other part, if it should become painful. The internal treatment was continued as before, except that the æther was omitted in the anodyne; he had forty drops of tincture of opium in a cardiac draught, night and morning; the wine was continued, and he was to have panada with wine.

November 1.—*Third day.* He was very uneasy during the last twenty-four hours; his

slumbers were much disturbed; he was incoherent when he first awoke; and he was delirious at different times in the night. The *puffiness* of the cellular membrane of the face and hands still continued, and a degree of secretion was appearing in different parts where the skin had been vesicated: this was the only favourable symptom that I could discover in my patient; for independent of that, he appeared in several respects worse, as the functions of the brain were much disturbed. Probably the same irritation which had generally affected the external cellular membrane, even in parts which were not burnt, might have been communicated by sympathy to the cellular membrane accompanying the nerves, thus forming that state of the sensitive powers which we observe in coma, and in some conditions of fever. The state of the brain and nervous system which I am describing was termed *engorgement* of the brain, by the late Dr. Clark, of Newcastle-upon-Tyne, whose observations and delineation of the symptoms of fever are most correct, and deservedly esteemed by all medical practitioners. The pulse was still 130, the urine was small in quantity and high-coloured. He had had no evacuation by the bowels since the accident. As his stomach would bear nothing but liquids, and as every thing depended upon keeping up the power of that organ, which is the great centre of sympathy, lest it should be put out of humour by cathartics, I ordered a large glyster to be administered. The same dressings with the poultices were applied, and the diet and medicines were continued as before.

November 2.—*Fourth day.* The glyster



produced a copious evacuation, which afforded him much relief: he had an easier night. A considerable quantity of pus was formed on parts where the cuticle was off. The eschar on the left thigh was beginning to thicken round the edge, shewing a disposition to loosen. The dressings were changed for the calamine cerate, and made warm by holding them to the fire previously to immediate application. Pulse 124; urine more in quantity, but still high-coloured; tongue moist; and thirst less. There had been an astonishing change during the last twenty-four hours: the whole system, which had been labouring the day before, and appeared nearly overcome, with scarcely any mark of purulent secretion, but on the contrary all gorged and tense from obstruction, had now re-established itself by assuming the salutary process of secretion. Such change, I believe, was entirely owing to the mode of treatment pursued, by which every latent energy of the system was vigorously unfolded to accomplish this object. The extent and scale of stimuli were carried to the utmost pitch, in this case, from the beginning to the period of secretion; keeping in view at the same time, to avoid producing indirect debility from excess. The case was conducted upon the principles I had before laid down; I was therefore prepared to proceed regularly through its different stages: for, as I expected such accidents, I was always ready to meet them. The sympathizing of the stomach assisted me much in regulating my treatment: it was retentive, and bore the necessary stimuli. I received considerable aid in hastening secretion by the external application of caloric.

by means of emollient cataplasms, though I ought to observe they were not intended nor used as emollients, but merely as vehicles to apply positive heat; for they were placed over the plasters of stimulant ointment. The benefit arising from the union of both internal and external management was strongly marked in the case before us. I have no hesitation in asserting my firm conviction, that had less active means been resorted to, this individual would have been added to the thousands who had been sacrificed to an opposite treatment.

I am anxious that this case should be strongly impressed on the minds of practitioners: for it may not fall to the lot of every gentleman to have an opportunity of making such comparative trials. I therefore hope my experience may be of use to them, and render it unnecessary that they should sacrifice the lives of some patients to acquire this important TRUTH. The wine was ordered to be withheld, the stimulating julep was desisted from, and only the anodynes continued; even these were diminished, to thirty drops of tincture of opium at night, and twenty in the morning. Boiled bread and milk was ordered to be the chief diet; but a little ale-posset was allowed, to prevent any ill consequence from a too sudden diminution of the great stimuli to which my patient had been so lately accustomed. The poultices, with the same intention, were to be continued another day.

November 3.—*Fifth day.* Appearances were highly satisfactory: an easy night had been passed; the swellings of the face and limbs were much subsided; the functions of the brain were nearly restored to their accustomed action;



and the secretion of pus was much greater than the day before.

In the sixth chapter of the former part of this essay, I mentioned Mr. Cleghorn's use of chalk ; since which I have had several opportunities of estimating its merits in slight cases ; I therefore determined to use it in the first serious case that occurred, and I was prepared for the occasion. Several pounds of finely powdered chalk were in readiness: a portion was put upon a plate, and placed in an oven in the patient's room, to acquire the heat of about 100 degrees of Fahrenheit's scale. Immediately upon exposing the surface of the wounds, by taking off the plasters, which was done partially, i. e. by exposing only one part at a time, and finishing the dressing of that part previously to exposing another, the surface of the wound was plentifully covered with the powdered chalk, and as much allowed to remain as would adhere to the moist parts, which were directly afterwards covered with plasters of the calamine cerate, and warmed previously to their application. The poultices were omitted ; the anodynes were continued as before ; so was the diet.

On the sixth, seventh, and eighth days nothing remarkable occurred, except that the secretion of pus, from the surface of the irritated skin, and the loosening of the eschars, became very considerable ; and on the latter day, as nearly as I could ascertain, there was above a pint upon the different plasters. The diet, the medicines, and the dressings were all continued as before.

November 7.—*Ninth day.* The appearances in the morning were the same as they had been

for some preceding days ; but, in the evening, the patient's father came to inform me that he was seized with a severe looseness, which had commenced about noon. A pint of *mistura cretacea*, with two ounces of compound tincture of opium, was ordered ; of which he was to take a tea-cup full after each loose stool. An addition of ten drops of tincture of opium was added to this night's draught.

November 8.—*Tenth day*. I found him considerably exhausted by the diarrhœa : he had voided about *twenty* motions, with great pain and irritation in his bowels ; covered as he was with plasters, the rising so often to stool had fatigued him greatly. The discharge by the bowels was not much at a time ; after the two or three first motions, there was little *fæculent* matter, but what passed appeared more like pus and mucus. The most extraordinary appearance was that which had taken place upon the secreting surface of the sores : instead of being deluged with pus as formerly, they seemed nearly dry. His pulse was slower than it had been ; it was not quite 100 : for some of the first days after the accident it had constantly been 130 ; nor had I observed it less than 120. He was ordered to have rice-milk with a little cinamon, and to continue the *mistura cretacea* as before.

To what law of the system are we to ascribe this extraordinary appearance ? That the ninth day in accidents of this kind had ever appeared to me *critical* may be supposed ; for it must be remarked that in the third chapter of the former part of my essay, I had observed the fatal termination of many cases at this period. I have likewise remarked that in many diseases



which we in general term inflammatory, a crisis takes place on the ninth day ; as in the small pox, when it is regular and of a good kind. Is it that such a period exhausts the system, and that another series of parts are put in action, in the manner we observe in the retina of the eye, which ceases to act, although the same stimulus be applied, and another series of fibres assume an opposite action? This phenomenon is beautifully illustrated by the ocular spectra in Doctor Darwin's *Zoonomia*. Or, may this too abundant secretion, from such extensive and superficial sores, arise from the same cause as colliquative sweats in hectic fever, which we frequently observe alternate with diarrhœa? I am inclined to this opinion ; recollecting the case of Thomas Johnson, described in the former part of the essay, whose system became hectic from the plan of treatment pursued, under the idea of supporting and strengthening his system to bear up against the discharge. I believe the system was fevered, and obliged to relieve itself by a colliquative purulent secretion. Had I then known the utility of a counter-irritation upon the bowels, months might have been saved in the cure. Counter-irritation is a powerful means of suspending local morbid action. I have known a blister relieve an inflammation of the breast, much more effectually where a strangury had been produced, than where no such symptom had taken place. I have lately had a striking instance of the efficacy of counter-irritation. A gentleman had an inflammation of the neck upon the whole surface of the platysma myoides muscle ; notwithstanding profuse and frequent bleeding by leeches, general bleeding, and

smart purging, such was the irritable state of the parts, that inflammation was incessantly re-excited, in spite of various external applications, until fortunately I had recourse to a blister upon the sternum, which I kept open by the unguentum lyttæ: this blister, being kept very sore, became a focus of irritation, and the original seat of inflammation was quiescent.

November 9.—*Eleventh day.* If the appearances reported on the preceding day surprised me, those I observed at this visit surprised me equally, affording the highest satisfaction. On the former visit I represented the extensive sores as having ceased to secrete with the profusion they had done; I now found a *sheet* of skin over these extensive sores, which two days before were discharging a profusion of pus. I am confident that the new cuticle, formed in the space of twenty-four hours on the different and distant parts of the body, was equal in extent to a sheet of letter-paper; this quantity of new cuticle was more than I had ever before seen formed in the same space of time. It appeared that the balance of exhalation and absorption was so accurate, and the cretaceous application formed a shelly pellicle so rapidly, that it might be compared to the surface of an agitated lake, that on a sudden subsiding was as suddenly iced over.

The circumstance of the accidental diarrhœa pointed out to me a practical fact which, but for this opportunity, might have long remained hidden. It will be recollected, that in relating the case of Thomas Johnson, in the former part of the essay, I mentioned his being above a twelvemonth under cure: I even then hazarded a conjecture, that the length of time was



in a great measure owing to an ill-conceived prejudice, which I had adopted, of *supporting* the system during the increased secretion. I am now convinced, that such increased secretion was in a great measure produced by the means I intended should prevent it. Accident has thus pointed out to me the utility of an early counter-irritation upon the mucous membrane of the intestines, in cases of this kind. As soon as the irritated surface of the sores caused by the burn commences a free secretion of purulent matter, we should not only desist from internal stimulants, but we should commence a counter-irritation by the exhibition of brisk cathartic medicines. I am giving these directions from much experience ; for I confess there was a period, when such advice would have shocked my prejudices.

The parts continued to heal rapidly ; and in less than *three weeks* from the infliction of the accident (i. e. from the 30th of October to the 18th of November following) he was perfectly cured.

Though it is now eighteen years since this case occurred, in revising it I have such strong recollections of the leading facts, that I could hardly conceive a case more calculated to establish the practice I wish to recommend. By the first mode of treatment, I have no doubt but the life of the individual would have been sacrificed ; by the second mode of treatment, immediate death might have been avoided, and possibly by a year's laborious exertions, tender and unseemly cicatrices might have covered his sores ; but on the contrary, when I look at the termination of this case, I hope to be excused if I feel a degree of honest pride in the different result :

for can any thing be more gratifying than to ascertain that you have saved a life, that you have lessened the quantity of pain, that you have shortened by months the period of cure, and that the cure, when terminated, was happily so, and was not the mere continuance of a mutilated existence? In addition to this, I have endeavoured to point out, with the correctness of truth, that path to others which has conducted me to the desired goal. I have also the testimonies of many experienced surgeons to bring forward, shewing that I have succeeded in making my principles known; thus diffusing benefit to different and distant parts of our empire. Though I have boasted of success in this case, yet I acknowledge with humility and thankfulness the lesson I received from Nature by her efforts; a lesson which has benefited me from that time to the present. The advantage we derive from blisters originates in this source; and that derived from purging, in such a variety of complaints, most probably is caused by the counter-irritation upon the mucous membrane of the bowels rendering quiescent the original morbid irritation. In the case of Mr. Glynn, which the former part of my essay exhibits, it may be observed I finished by bleeding and purging; but the decided effects produced by such effort of nature, in Clark's case, fully determines this doubtful point in practice. I shall now record another case, which happened at the same time with Clark's; though the injury was less, yet, as there were some circumstances attending it which connect it with the former, I think it right to relate it.



## CASE.

THOMAS PYLE, a boy of fifteen years of age, was burnt by the same explosion as George Clark, but not quite so severely; though considerable eschars formed on some parts, and the symptomatic or irritative fever proceeded to an alarming height. He was treated according to the principles already laid down, both internally and externally, and by the means used was soon brought to what I have been induced to regard a state of safety, i. e. the injured surface becoming a secreting surface. Chalk was applied externally as an absorbent, and the internal stimulus was desisted from, as before recommended; yet the discharge continued too profuse. I have already mentioned that he was not so materially burnt as Clark; but the accidental diarrhœa produced such an effect upon Clark's system, that he was cured sooner than this boy. Regarding the beneficial effects in Clark's case to have arisen from the counter-irritation occasioned by diarrhœa, I endeavoured in some degree to imitate this effort of Nature by a brisk purge. It produced a very marked good effect, though not so decisive, as I durst not push my remedy to the extent that Nature had done in the former case. At the interval of a week I repeated the purge. Between the purgations, the diet was nutritive, but not stimulating: all fermented liquors were forbidden, and nothing hot was allowed. This boy's case required about a fortnight longer than Clark's to perfect the cure, though in degree and extent it was considerably less; yet, requiring a fortnight more, I esteem it a very speedy cure, as it was

completed in less than five weeks. According to the *first mode of treatment*, I believe the case would have been lost. By the *second mode of treatment*, his life would probably have been saved; but the length of time necessary to have brought about a cure may probably be judged of, by looking at the case of Thomas Johnson, in the former part of the essay. Nothing can more strongly point out the propriety of the *new mode of practice*, than frequently contrasting it with the results obtained by the old. My practice at that time, in giving a purge at the interval of a week, was trifling and timid; I should act differently at present: I might give one every other day, or one less violent, such as a solution of Epsom Salts, every day, which would not injure the digestive powers. Such a course might be continued during the whole cure, occasionally adding a small dose of submuriate of mercury at night. The great utility of purging in fevers, as pointed out by Doctors Rush, Hamilton, and others, may most probably arise from the counter-irritation kept up on the surface of the intestines; by means of which, any determination to particular parts, and consequent congestion, will be prevented. What an extensive variety of complaints does this principle embrace!

In the former part of the essay, I noticed the similarity in the composition of gunpowder with that of the explosions of carburetted hydrogen in mines; the difference is merely the inversion of the order of the phænomena. This being the case, it will be natural to suppose I should treat burns occasioned by the explosion of gunpowder upon the same principles I recommend for those by explosions in mines. I shall



therefore relate a case which happened in my practice, and answered to the expectations I had formed of its utility.

### CASE.

JOHN DUNWIDDIE, aged ten, had his face and hands burnt by an explosion of gunpowder. I was sent for to visit him in the country. His face was much burnt: the eye-lashes and the hair of the eye-brows were destroyed; the right side was more severely injured than the left; the eyes, being thus exposed to the effects of the explosion, were injured, and he felt great pain in them. Oil had been applied to all the burnt parts before I saw him, which was about an hour after the accident. He was in exquisite torture, crying, shivering, and stamping about the room, as if mad. I instantly gave him a powerful anodyne, and bathed the parts with heated essence of turpentine; I then covered them with plasters spread thick with basilicon and essence of turpentine; he was afterwards put to a warmed bed; I remained about half-an-hour, when I found he began to grow easy. The anodyne was repeated at night. On the following day I found he had rested well; the dressings were repeated as the day before. In two days more, suppuration had commenced in parts about the right eye; and in other parts of the face the skin cracked and peeled off in scales. The dressings were now changed; chalk and the calamine cerate were used, and in the course of ten days he was tolerably well,

except that a tenderness about the eyes remained, which yielded to a few brisk purges, and a collyrium with sulphate of zinc.

I could add many other cases, tending to point out the efficacy of the mode of treatment I recommend ; but, as there was little variety, and I have wished to avoid swelling my work with trifling cases, more particularly those under my own care, I shall for the present desist. To surgeons of the army and navy I cannot too strongly recommend my practice. Conversing with officers in different departments of the public service, I find a number of men are destroyed by burns, from the explosions which happen in laboratories, in the field, and on shipboard. It will be gratifying to me to believe, that if I have it not in my power to prevent men being exposed to danger, yet I may be the means of saving their lives or mitigating their sufferings, when brought into such situations by concurring circumstances over which they had no controul. I must beg to bestow my tribute of thanks to Doctor Trotter, for his recommending the attention of navy-surgeons to the new practice. To his industry and investigation the public are much indebted the subduing of sea-scurvy in our fleets, which was entirely atchieved by him, must for ever entitle him to the esteem of his country. The spirit of investigation he has excited in the medical department of the navy leads to the expectation of much advantage.

I shall now adduce the testimonies of others, to corroborate and establish the practice which I am so anxious to diffuse. The following is a Letter from Mr. Stephen Hammick, Jun. of the Royal Naval Hospital, at Plymouth ; whose zeal



and ability in his profession are well known, and require no panegyric from my pen.

*“ Fountain Court, London, Sept. 26, 1799.*

“ SIR,

“ IN answer to your letter, which I had the honour of receiving a few days since, requesting my treatment of burns, I beg to state, that during the last seven years, whilst I was employed as an assistant-surgeon at the Royal Naval Hospital at Plymouth, I had frequent opportunities of having under my care and management, a number of men who had been severely burnt by the explosion of gunpowder. At the beginning of this war it was our general practice to keep the parts constantly wet, either with vegeto-mineral water, crude sal ammoniac wash, or vinegar. Although these applications gave our patients ease for a time, yet this ease was not of long duration, neither were the benefits derived such as to satisfy our minds of their utility; as we found that our patients did not receive those permanent beneficial advantages which had been attributed to them; we therefore had recourse to rectified spirits of wine, in which was dissolved a pretty large quantity of camphor. This mode succeeded more to our wishes. But when your ingenious treatise on burns fell into my hands, I resolved to put it to the trial in the first recent case of burn that presented itself, and unfortunately I had not long to wait for such an one; to which I immediately applied the spirit of turpentine, in a full and free manner; though I must admit that I did not give my patient, internally, the liberal allowance of spirit and laudanum which

you have so forcibly recommended. The application of the turpentine was attended with much burning and smarting, as the patient expressed it, for about an hour; at the expiration of which, he fell asleep and rested tolerably for about two hours; and, when he awoke, he declared that he found himself much relieved. No ill symptoms supervened, and the process to suppuration in this case was rather more rapid than in any I had before witnessed. The after-stages, however, were nearly, if not quite as slow as in those patients who had been treated by the cold applications. Prompted by the success of this case, I tried it in several others, and with equally beneficial effects. From strictly watching and minutely attending to burnt patients, (my residence having been within the walls of the hospital for more than seven years,) I am decidedly of opinion, that the practice of applying immediately to burns the spirit of turpentine is the best I have ever yet seen adopted; as the process to suppuration is in general more rapid, and those irregular marks or seams found after other applications are not to be met with after the turpentine; neither is the skin so disposed to crack or break open again, as was formerly too often the case; an event producing the most troublesome and irritable sores.

“ Not thinking ever to be called upon to give particulars of my practice in burns, I did not make any notes: what is above stated is given merely from memory; but the success of the practice was so great, that it was engraven so forcibly on my mind as not to be easily effaced; and should you think this letter of any importance, it is entirely at your service.



“ Should you wish any further information on the above points, I desire you to wave all ceremony and demand it, from

“ Your obedient servant,

“ STEPHEN HAMMICK, Jun.”

This letter of Mr. Hammick's is of great importance: he was resident in a hospital for more than seven years, where a constant succession of such accidents were subject to his examination. The inefficiency of the common modes was apparent, and he was in a situation to form a comparative estimate of the value of different applications. He had seen the effects of *cold*, as applied by means of rags wet in the vegeto-mineral water: though the cold applications gave ease for a short time, yet they did not hasten the cure: he became dissatisfied with them, and doubted of their utility. Other applications were had recourse to, and of a very different nature, as spirit of wine with camphor. From all this previous experience, Mr. Hammick was in a situation to appreciate the power of any remedy: he tried the essence of turpentine, the power of which was so great as to astonish him: the impression it made upon his mind, he says, will not easily be effaced. I regret he did not pursue the whole of the treatment, as recommended. Should opportunities occur, and he should add the internal treatment to the period of suppuration, and then use the carbonate of lime as an absorbent, with brisk cathartics in the latter stages of the treatment, I think he would confess, that to have advanced

from the state of uncertainty we were in, when I commenced the investigation, to the degree of certainty we have now arrived at, is a most rapid and gratifying progress towards the attainment of truth.

I was favoured with the following letter from the late Mr. Frederick Horn, surgeon to the Newcastle-upon-Tyne Infirmary.

*“ Newcastle-upon-Tyne, 11th May, 1800.*

“ DEAR SIR,

“ I have not been able to find the account I mentioned to you, about the child who was scalded by boiling-water, and who was the first patient whom I treated in the manner recommended in your book ; I must therefore content myself by saying it induced me, as much as one case could do, to give your method a preference to every other I was acquainted with.

“ The colliery for which I am employed is so fortunately situated, and so judiciously managed, that no accident from fire has occurred since the year 1786 ; so that I have had but a very confined practice in burns. The trifling things of that nature, which I have had under my care, in private practice, have been uniformly treated in your way, and the result has always added to my confidence in the method.

“ From the time of your publication until the 7th of September 1799, I had no case worth communicating. On that night, Mr. Row's tar-yard caught fire, by the blowing off of the head of a still in which they were preparing coal-oil. Several butts of this burst into flames, while a poor sailor was in the midst of them,



endeavouring to push them into the river. He was very severely burnt in various parts of his head, body, and limbs. It was about an hour after the accident before I got to him; during which time the neighbours had been continually employed in anointing the burnt parts with oil, by means of feathers. The poor fellow (although very resolute) was complaining much of the severe pain. I began immediately to apply the Ol. Terebinth. from which he felt a most pleasing relief, and was so sensible of its good effects, that he carefully placed one arm under the other, to catch every drop that fell from the part I was applying it to. I dressed him with Ung. Resin. Flav. thinned with the Ol. Terebinth. and as the man was in a very indifferent lodging, I sent him to the Infirmary, where you would see the event of the case. I will just remark, that from the carelessness of a person who was holding a candle, my patient had nearly undergone a second burning; and from the very inflammable nature of the turpentine, and the hurry people are in on these occasions, such a thing might easily happen.

“ The 10th of March last, I was called to a little girl, seven years of age, daughter of Capt. Bainbridge, of the Ferry, Dentshole. Her clothes had caught fire from a hot poker, placed perpendicularly against the wall, while the child was standing near it. She was very severely burnt all over the face and breast; her neck and left arm-pit had suffered very much, and many parts of her body in a slighter degree. Cold water, scraped potatoes, and whatever the neighbours could suggest, had been used until I got there. The child was complaining very much, when I began the application of the oil of

turpentine, previously made warm; and although it was applied to the naked cutis, in several parts where the blisters had been injudiciously cut, she ceased to complain as she had been doing during the former treatment. While I was spreading the plasters (of Ung. Resin. Flav. c. Ol. Terebinth.) I desired the attendants to use the oil freely to all the parts which were suspected to have been affected by the fire, particularly to the right side of the breast, neck, and shoulder, where an appearance had taken place very much like an erysipelas, when the skin begins to form blisters. These I afterwards covered (as well as the parts more severely burnt) with the ointment spread on linen; and I gave the child a glass of brandy and water, with twenty drops of the Tinctura Opii; and another anodyne at night, with fifteen drops.

“Next morning I found she had passed a very quiet night, of which her mother’s expression will give you a better idea than any thing I can say. On my asking her how the child had been? ‘Finely,’ says she: ‘she has never said *Oh dear!* since you left her.’ I removed the dressings, and was much pleased to find the parts where the skin was just beginning to form blisters, in the manner I have before mentioned, had gone no further in that process. They now assumed a brownish appearance, and no other effect was produced in the progress of the cure, than a desquamation of the cuticle.

“The cheeks and parts, where the burns had been deepest, were covered with a thick yellowish crust of a purulent and somewhat *curdly* appearance. The oil of turpentine and the ointment were continued the first four days; after which, she was dressed with a cerate of



wax and oil, and I had no other trouble in her cure than being obliged to apply occasionally a little of the Vitriol. Cœrul. to a fungus which arose on the wound in the neck. I discontinued my visits on the 6th of April; and yesterday I saw the child, who is very little marked, and that merely where the parts were most severely burnt.

“ I am, dear Sir, your’s truly,

“ FREDERICK HORN.”

This letter merits some attention. We see that Mr. Horn’s mind had been weaned from the old mode of treatment, ever since the time I published the first part of my essay: every slight opportunity he had of trying its efficacy emboldened him in the practice; so that, when a serious accident happened, he was ready to treat it in all points as I had recommended. I felt obliged to Mr. Horn for pursuing the whole plan of treatment; though the case related of Captain Bainbridge’s child might have succeeded without the internal stimulus and powerful anodyne: for such the twenty drops of tincture of opium to a child of seven years old may be called, particularly when repeated at night with fifteen drops; but when we regard the powerful effect of abating pain, as was to be seen in this case, we surely must strongly approve the practice. The impression was such upon the mother’s mind, whose feelings had been wounded by the constant cry of “Oh dear! Oh dear!” which probably had been reiterated a thousand times,

that on the following morning, when Mr. Horn inquired how the child had been since he left her, she emphatically burst out with the following exclamation: “ Finely, Sir; she has never said *Oh dear!* since you left her.” Could any thing be more expressive, or more decisive of the benefit derived from the mode adopted? The success which Mr. Horn experienced in this case, induced him to try the full extent of the new practice in a case of much greater importance: this he communicated to me by the following letter.

“ Newcastle, 25th July, 1800.

“ DEAR SIR,

“ I have great pleasure in communicating to you another instance, where your method of treating burns has been successfully employed.

“ George Smith, an under-viewer in Ravensworth colliery, was severely burnt on the 3d July 1800, by a quantity of inflammable air taking fire in the pit into which he had just descended to give directions to the workmen. The explosion was so violent as to drive up stones, &c. to the top of the shaft (above sixty fathom); and the shock was felt, and the report which accompanied it was distinctly heard, by some farmers who were in bed in their houses, at some distance from the place.

“ I found him, two hours after the accident, with his hair singed close to his head. The whole cuticle was peeled off from his face and neck, which were quite black with the fine coal-dust that had been driven so forcibly upon them. He was burnt in different places about his loins, and from the knees to the ancles,



except some small patches, where the skin had only been scorched.

“ On looking at his hands, I was shocked with their appearance : on taking hold of them, the skin and nails came off, exactly like a torn glove, and the extensor tendons of the fingers were bare in several places. In short, he was the most severely burnt of any patient who ever came under my care.

“ Nothing had been done to him before I saw him, as he had only just been brought home. He had frequent shiverings ; and, although a very resolute man, complained much of pain, and thought he must have been injured in his lungs, from the sense of heat he felt there, and from the bad taste in his mouth.

“ There was some strong gin and water on the table when I went in, and I immediately gave him a large tumbler-glass full of it. I warmed some oil of turpentine, by holding a cup of it in boiling water ; and I directed the attendants to bathe him assiduously with it, by means of probes armed with lint, and dipped into the spirit. This was continually done, while I was employed in spreading plasters, (*viz.* Ung. Resin. Flav. c. Ol. Terebinth.) and the poor man found much relief from it. He however complained much of his hands, which were very painful, and smarted at the time of the application, but soon had a much easier feel. I applied the plasters to every part where I suspected the fire to have reached, gave him another glass of strong gin and water, to which I added sixty drops of laudanum, and I desired he should have more of the spirit, if the shiverings should recur.

“ In the evening I found him tolerably easy,

and, considering his situation, wonderfully so. He had been my patient fourteen years ago, when he had been pretty much burnt, although not near so severely as at this time; and had then been treated with ol. lin. c. aqua calcis, to which a portion of the tinct. opii. had been added, and he remarked, "*that the fire, he thought, seemed likely to be killed sooner now than before.*" He had taken gin and water only once since morning, when he had a return of the shivering; and his attendants had moistened the plasters with Ol. Terebinth. at his own request, from the relief he thought he felt from it. I gave him sixty drops of laudanum in a little spirit and water, to be taken at bed-time.

"In the morning I found he had passed a tolerable night: I removed the plasters, and found some slight appearances of suppuration, particularly on the face, where a lardaceous appearance had taken place, but of a black colour, from the coal-dust. I bathed the burnt parts again with the Ol. Terebinth., renewed the dressings, and allowed him gin and water, to be taken when shivering (which now and then threatened him) should occur. At night he took sixty drops of laudanum; his bowels kept open, and he made no complaint of pain except in his hands.

"*Third day.*—There is a tolerable suppuration on the face, neck, body, and legs. The blackness, from the coal-dust, which appears to be firmly attached to the cutis, is separating fast, in the form of black lard. He remarks, *that the fire is killed every where but in his hands.* He was dressed with ung. resin. flav. with a less proportion of Ol. Terebinth. He is forbid the use of spirits, but allowed porter, as



far as three pints in the twenty-four hours, if he chuses so much. His anodyne is continued.

“ *Fourth day.*—The suppuration in the face, body and legs, goes on well, and several parts are now turning florid, as the blackness disappears. The scorched parts have neither blistered nor run into suppuration. There is a large discharge of thin ichor from the hands; and on some parts of the fingers there is still a thick gelatinous matter adhering. His allowance of porter is continued. He has no shiverings. Dressings are changed for cerat. e lapid. calamin. Anodyne continued.

“ *Fifth to the Eighth day.*—Going on well;—treatment continued;—bowels open;—allowance of porter diminished to a pint and a half per day.

“ *Ninth day.*—Suppuration large;—all the blackness gone off;—discharge from the hands still thin, and in great quantity, attended with much pain. Prepared chalk, finely powdered, is ordered to be sprinkled on all the sores, covering it with cerat. e. lap. calamin. spread on rags. He is to take five grains of calomel at night, and to have a purge in the morning.

“ In the afternoon I was suddenly sent for to him:—The pain in his head was intolerable, and he had two smart shivering-fits. Having never before seen chalk applied, I attributed the pain to its use; but on taking off the dressings, I found my assistant had not applied any of it to the hands. He had used it liberally to the face, neck, body, and legs, and these parts were *perfectly easy*. I ordered emollient poultices to be applied to the hands and arms, and renewed every eight hours. The chalk was continued to the other parts.

“ *Tenth and Eleventh days.*—The treatment continued. Pus on the face, neck, and legs, of good consistence, and no pain in these parts. The hands are easier after the poultices are first applied, but soon become so painful as to make him urgent for a renewal of them; and when they are taken off, the discharge of thin matter pours from them. Finding the chalk agree so well with the other parts, I sprinkled his right hand freely with it, and covered it with the cerate-plasters. He felt, as he said, a little tingling from the application, and wished to have the poultice continued to the left hand. I was glad of the opportunity of making this comparative trial, and allowed it to be so.

“ *Twelfth day.*—Head, neck and legs much better;—loins nearly healed. I speak within bounds, when I say four square inches of skin have been beautifully formed on one leg, since yesterday. I know no term which will give so good an idea of this process as *icing over*; the extent covered, and the smooth shiny appearance being so like an icy pellicle formed on a smooth piece of water.

“ *Fifteenth day.*—Face and legs mending fast;—loins well;—his hands completely raw, and bleeding from every point;—the poultice on the left hand is deluged in thin matter, and this hand is by far the most painful. The right hand, covered with the chalk, although painful, is not nearly so much so as the left, and the man is anxious to have the chalk applied to it, which is allowed;—anodyne continued;—five grains of calomel at night, and a smart purge to be taken early in the morning.

“ *Sixteenth day.*—He had two copious evacuations from the calomel and purging-powder;



—every part better ;—the left hand much easier, but the granulations much looser than the right : they bleed more readily, and are more painful.

“ *Seventeenth day.*—One leg quite skinned over ; face and other leg much better.

“ *Twenty-first day.*—The face and neck quite skinned over, except a small part of each eye-lid, and the nose ;—right leg almost healed ;—right hand skinned over above the wrist, to the ends of the fingers on the inside, and much better on the back part ;—left hand, to which the poultice had been so long applied, begins to grow better, but is far behind the other, so as to give a most decided preference to the chalk. He is now so well that I have allowed him to go into his garden.

“ You see, my dear Sir, that I have been tediously circumstantial in my account of this case. I now deem my patient so near well, that I shall discontinue my journal ; and I have only to add, that I have been so particular in the recital of the treatment, because perhaps you have no case which furnishes such a fair opportunity for comparing your method with others commonly used. The poor fellow had felt the old method with oil, &c. and was therefore well enabled to appreciate the present plan, especially as he is a man of great resolution, and of strong natural sense. You have also had frequent opportunities of seeing him during the cure, and of convincing yourself of the truth of every circumstance. And I think the trouble you have had in rescuing this important branch of practice from the rude hands which so long held it, will be well repaid, were it only with the reflections this case will give you. —As a memento of my sense of the obligations

the profession have to you, and to shew, as my poor patient says, there was *ne bairn's play in this burn*, I beg your acceptance of a preparation I have made of the skin and nails.

“ I am,

“ Dear Sir,

“ Very sincerely, yours,

“ FREDERICK HORN.”

When I published the former edition of this part, I stopped the press to insert the above letter. From it will be seen, that Mr. Horn had considerable opportunities of appreciating the new practice: in the case of George Smith, we observe that he had fully, freely, and judiciously urged the system, as recommended, to the point of suppuration. On the eighth day I visited the case with Mr. Horn: there was a profuse thin ichorous discharge, more particularly from the hands. I recommended the free application of carbonate of lime, as an absorbent, and to improve the nature of the discharge. From accident it was not at first applied to the hands, and afterwards, from the feeling of the patient, only applied to one; the marked advantage produced by this application is strongly pointed out in Mr. Horn's narrative of the case. He had not previously seen the use of the carbonate of lime, and it gave me much pleasure to shew the advantages of this improvement in practice, to one so much possessed of the *oculus eruditus*. Though the *skinning*, *shelling* or *icing* process was not so rapid or so extensive as I had experienced in the case of George Clark, yet it was so unusual as to make a strong impression on the mind of Mr. Horn;



which will readily be observed, from the manner in which he has remarked upon it. The fungus, which by the old method was so luxuriant as to bid defiance to all efforts made to suppress it, and which was the chief cause of the unseemly cicatrices and other deformities so frequently observed in the cases of burns, was, by the application of carbonate of lime, nearly prevented; and the secreting surfaces skinned with such rapidity, as to prevent the ulcerous state of sore taking place. Mr. Horn's account of the case is only continued for about three weeks, namely, from the third to the twenty-fifth of July; I saw the sequel of the case, which was much hastened by repeated purges: the abundant secretion of pus from the injured surfaces was so checked by the counter-irritation of the mucous membrane of the intestines, that the skinning was most rapid at the expiration of three weeks, making six weeks in the whole, when the cure was compleat. More than as many months by the former method would have been required; when, after all, the cure would probably have been most unseemly. The observation of George Smith himself is strikingly illustrative of the benefit arising to the individual from the new mode of treatment. Fourteen years before this he had been burnt, though not so severely as in the present instance, and the observation he made was most forcible: "the fire, he thought, seemed likely to be killed sooner now, than before." Mr. Horn very liberally confessed the great superiority of this treatment, and availed himself of it in many instances; several years after this, he informed me he had saved the life of Miss Bulman by the same practice.

The following letter from Mr. Fife, giving an account of a severe scald, will be read with interest by those who have seen such accidents.

“ DEAR SIR,

“ Since you favoured me with your ideas on the treatment of burns, I have had frequent opportunities of trying the Sp. Terebinth. as an external application; and I feel peculiar satisfaction in stating, that in every instance the employment of it has been attended with uniform success.

“ As I am not engaged in colliery practice, the cases which have hitherto come under my care have been principally of the nature of scalds; and when I contrast them with similar cases, conducted under a different order of treatment, the result is truly astonishing.

“ The first that I shall notice is that of John Weatherspoon, a brewer, who, on the 25th of November 1797, fell into a copper boiler: they had fortunately just before pumped off the greatest part of the boiling wort it contained, so that not more than eighteen or twenty gallons remained in the copper at the time he fell; he was, however, most severely scalded; and I, being immediately sent for, saw him very soon after: I found him almost frantic with pain, and trembling to as great a degree as any one I ever saw during the cold stage of an ague. On taking off his cloaths, the epidermis peeled from the whole scalded surface; the parts which had suffered the most materially were the lower extremities, back and one arm. I gave him a draught containing fifty drops of laudanum, and immediately began to apply



very liberally the Sp. Terebinth. to all the affected parts. At first he complained of increased heat and smarting, but this was quickly succeeded by a soothing sensation; and, continuing to apply it some minutes longer, he said he felt himself almost quite easy. As a dressing, I now made use of the ung. resin. flav. rendered soft with the Sp. Terebinth. and being put to bed, the shivering soon went off. He passed a tolerably quiet night, and, on removing the dressings the next day, the scalded surfaces appeared clean, florid, and very moist, with a copious thin secretion. The ointment was again applied, but with a less proportion of Sp. Terebinth. On the third day the secretion put on a purulent appearance: the Sp. Terebinth. was now entirely omitted, and the parts dressed with ung. resin. flav. alone. By the fourth day suppuration was completely established, and the surfaces exhibited a healthy aspect; and, as the discharge of pus was considerable, I laid aside the ung. resin. flav. and substituted the cerat. lapid. calamin. which was continued until he got quite well. In less than a fortnight from the time of the accident, the arm, which had been stripped of its epidermis from the shoulder down to the fingers, and a great part of the back and legs, were perfectly cicatrized; the only parts then remaining open were about the ancles and the lower part of the back, and these were healed in the course of the week following, so that his cure was compleat within three weeks from the accident. He was allowed to live as usual without restraint, and his health and strength were very little impaired.

“ This case brought to my recollection one of a similar nature, which occurred about

sixteen years ago: this patient was a brewer likewise, and he by some accident slipped into a boiler, nearly up to the knees; the epidermis came almost entirely off with his stockings, and he suffered extreme pain, with repeated shiverings. A liniment, composed of equal parts of the ol. lin. and aq. calcis, was plentifully used for some time, to the whole scalded surface; over which soft old linen, spread with ung. sperm. cet. was applied; opiates were given to assuage the pain, but at the same time the antiphlogistic regimen was strictly enjoined, until suppuration took place, which I remember was very profuse; he was then allowed a more generous diet, but the discharge continuing very great, he became much reduced in flesh and strength, and the cure proved extremely tedious, in spite of every care and attention: to the best of my remembrance, it was between three and four months before he got quite well.

“ Were it necessary, I could mention several other cases of different degrees of injury, in all of which the external use of *Sp. Terebinth.* proved equally serviceable; but not having particularly recorded them, I shall only observe, that in every trial I have made, the result has been so highly satisfactory, as to leave the fullest conviction in my mind of the superiority of this mode of treatment over every other I am acquainted with.

“ Allow me now to acknowledge the obligation I feel, as an individual, in being thus enabled to afford more effectual relief to such as may require my assistance; and I think it but justice to say, that the profession, as well as the community at large, are much indebted to you for your indefatigable exertions in



the improvement of this important branch of surgery.

“ I am, dear Sir,

“ With great esteem,

“ Your's, very sincerely,

“ WILLIAM FIFE.

“ *Westgate-Street, May 20th, 1800.*”

The above case is very interesting: Mr. Fife is a surgeon of great practice: his opportunities for experience had been extensive, both in London and Newcastle; he was perfectly equal to form a correct judgement of the comparative value of the different modes of treatment. It is by the testimonies of such men as these that I expect my labours to be duly appreciated and established. I prefer the discriminating opinion of one such judge, to ten thousand cases of cures related by ladies and gentlemen: such relations may prop up the reputation of the tractors, or of animal magnetism; but the unfortunate dupes who believe in such cases, and are treated according to such principles, will deservedly fall a sacrifice to their folly.

Mr. Bell, surgeon in the navy, whose examination I have before mentioned, gave me the following account in a letter. “Another case, besides that I have mentioned in the Medical Journal (volume 3d, page 206) occurred during our passage from Lisbon, that I think deserves notice. A man standing near the cook's coppers, in which salt pork was boiling, drying a pair of trowsers, during a hard gale of wind, when the ship *lurched* so much as to throw a quantity of boiling water and grease

over that side of the boilers where he had stood, received the greatest part of it upon his hands and arms, and complained of most violent pain. The Oleum Terebinthinæ was instantly applied warm, and in about an hour he became easy. On the following morning these scalded parts were found *cured* by the first intention, except a small place on the left wrist, where the epidermis had been stripped off, by endeavouring hastily to wipe away the hot grease with his trowsers. I think this case speaks sufficiently for itself, and I shall only add, that the small place mentioned was well in *four* days." Scalds, from boiling broths or grease, are in general very difficult to cure; as the oily particles are capable of containing a great quantity of caloric, and frequently produce such effects upon the parts on which they fall, as to occasion tedious suppurations; but, in this case, the speedy application of the remedy appears to have obviated every ill effect.

The application of Essence of Turpentine to a burnt part is by many supposed to be a painful and cruel application; but I have found it the contrary, generally abating and soothing the pain, particularly in infants, where no prejudice could exist. This is noticed also by Mr. Bell, who, in the Medical and Physical Journal, vol. iii. p. 296, says: "an infant was so scalded by a basin of tea, over the breast and abdomen, that some of the epidermis was torn off in undressing the child, who in this state was so copiously washed with heated Essence of Turpentine, that soon after it fell asleep, and passed a remarkably good night. The anodyne power of Essence of Turpentine, when applied to young children smarting under the influence of scalds and



burns, was mentioned to me by Mr. Westgarth, who had seen much of the practice when with me, and to whom frequent opportunities had occurred of applying it in his own practice. I am inclined to account for this fact in the following manner: Heat increases the action of the part to which it is applied, and produces pleasurable sensation; pushed still further, it produces pain: when increased action is excited so as to produce pain, if we gradually lessen that action we shall bring it down on the scale to pleasurable sensation: sensation produces sympathetic effects on the brain and nervous system: when these effects are of a pleasurable nature or kind, the almost *vegetative* system of a child is soon placed in the state of sleep. It is also a common effect with older subjects, who are not annoyed by the pressure of care, and may be considered as children of a second growth. A good dinner, and a few glasses of wine, will frequently produce a similar effect upon them.

Having thus developed the principles upon which my practice is founded, and detailed that practice in severe injuries, from the point of infliction through the whole circle of diseased actions until we again arrive at health, I trust I have completed the proposed subject: I shall therefore take leave of my reader.

FINIS.





THE HISTORY OF THE  
CITY OF BOSTON  
FROM THE FIRST SETTLEMENT  
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BY NATHANIEL BENTLEY  
OF THE BARRISTER AT LAW  
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AND OF THE COUNSELLOR AT LAW  
IN MASSACHUSETTS  
VOL. I.  
BOSTON: PUBLISHED BY  
J. B. BENTLEY, AT THE  
PRINTING OFFICE OF  
J. B. BENTLEY, NO. 10, NASSAU ST.  
1822.









